WEG DAY 2017

Innovation & Technology Trends

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These statements involve risks and uncertainties and therefore depend on circumstances that may or may not occur. Investors should understand that general economic, industrial, and other operating conditions may affect WEG's future performance and lead to results that differ from those expressed in such forward-looking statements.

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Agenda

WEG Day 2017 - Innovation & Technology Trends

05/12 - Friday Location: WEG Auditorium		
08h00	Opening	Paulo Polezi
08h15	**Innovation, product development and new technologies -** Motors, Automation, Energy, T & D and Paints	Milton Castella / Sebastião Nau / Directors
10h00	Coffee Break	-
10h30	**Innovation in the productive process (WMS** – WEG Manufacturing System)	Sérgio Wonczewski
11h15	**Considerations and closure**	Harry Schmelzer Jr.
12h00	Lunch	ARWEG
14h00	Visit to WMO / Tooling Innovation Labs	Manufacturing Park I
16h00	Departure to airport	-

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Presenters

Milton Castella
Research and Innovation Director

Sebastião Nau
Research and Innovation Manager

Sérgio Wonczewski
Industrial Engineering Manager

Participants

Harry Schmelzer Jr.
CEO

André Rodrigues
CFO

Paulo Polezi
Director of Finance & IR

Manfred Johann
Director Automation

Carlos Prinz
Director T&D

Luis Tiefensee
Director Motors

Reinaldo Richter
Director paints & Coatings

Reinaldo Stuart
Director Industrial Automation

Daniel Godinho
Director Corporate Strategies

Eduardo Nóbrega
Director Energy

Hilton Faria
Director of Institutional Relations and HR

Joao Paulo
Director New Energies

Luis Gustavo Iensen
Director International

Wilson Watzko
Director Controlling

Aldo Manke
Director Industrial T&D

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“There's always a way to do better.”

Werner Ricardo Voigt

Werner has always been a technology man. WEG's chief technology officer, he also contributed to the development of the Brazilian industry. He’s long-term vision, together with the technical capacity were decisive in the implementation of technical standards in WEG and in the country. Likewise, He’s influence was important for the company to adopt the International Electrotechnical Commission (IEC) standard, based on the metric system.

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Presentation Schedule

- General policy and innovation processes
- Organization and structure - people and physics
- Patent protection policy
- Investments and sources of financing
- Results and awards
- Innovation in products and applications

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Innovation in WEG

RESEARCH → *More technology*
More knowledge

DEVELOP → *Innovative products and processes*

DOCUMENTATION → *reports, drawings, technical specifications, technical papers, standards (WEGNOLOGY), software etc.*

DIFFUSION, PERPETUATION AND TRAINING

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Research and Innovation

RESEARCH

KNOWLEDGE

KNOWLEDGE

INNOVATION

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Innovation Strategy and Vision of the Future

WEG Strategic Technological Planning

Technological Strategic Planning of each Business Unit

PWQP - WEG Quality and Productivity Program

- Scientific and Technological Committee
- Committees (Support / suggest / create demand)

PDT - Technological Development Program

Product Development Flow (Business units)

Technological Innovation Flow (Business units)

Execution of activities (Business Units)

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Portal of Innovation

ENTRY

Specialists

Universities

Scientific and Technological Committee

Innovation Awards (internal and external)

Market / Customers

Fairs, Seminars and Congresses

Market Associations and Regulators:

- ABNT / COBEI
- IEC / NEMA
- ABINEE
- ANPEI

Competitors

DEVELOPMENT OF THE IDEAS / PROPOSAL

EVALUATION

Committees

Technology for Electric Rotating Machines Committee

Product Development and Modification Committee

Marketing Committee

Product Portfolio Committee

APROVAÇÃO EM DIRETORIA

RESULTS

DEVELOPMENT

Research

New technology

New product platform

New product

Customer Specific Product

New process

New material

New test method

Patents of Invention, Utility Models, Industrial Designs

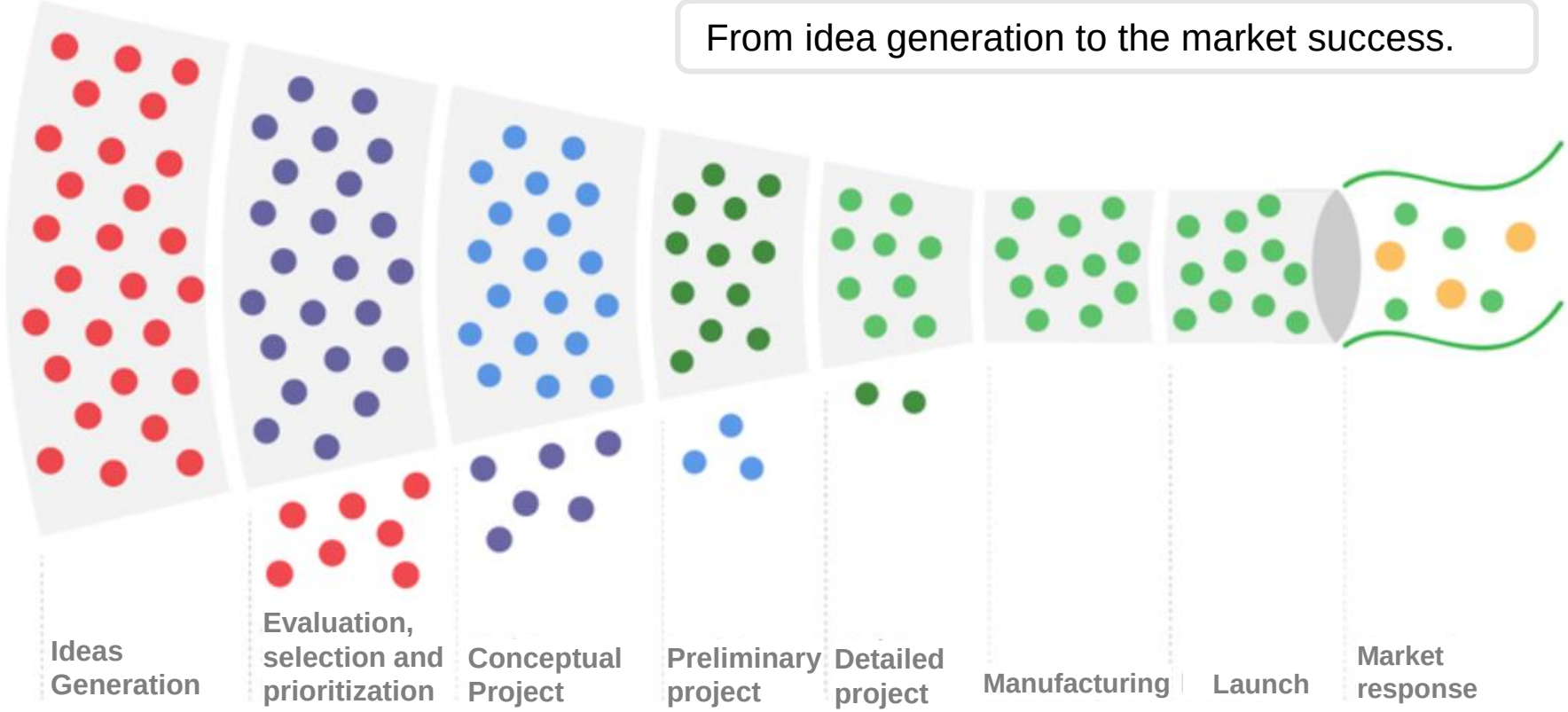
Innovation Focus

			NEW AREAS OF INTEREST
MOTORS	Energy Efficiency Competitiveness Reliability	›	Connectivity (Industry 4.0) Electric Powertrain
ENERGY	Energy Efficiency Competitiveness Reliability	›	Connectivity (Industry 4.0) Wind power
AUTOMATION	Energy Efficiency Competitiveness Reliability	›	Connectivity (Industry 4.0) Generation of solar energy and energy storage systems Systems for electric mobility and naval propulsion
T & D	Energy Efficiency Competitiveness Reliability	›	Mobile Solutions Development of new materials Connectivity and monitoring
PAINT	Energy Efficiency Competitiveness Reliability	›	Nanotechnology Sustainable products Smart Coatings

Product Development Flow

Process Stage Gate

From idea generation to the market success.



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Product Development Flow

Entry of new ideas

GATE 0

Gate 0: CPP

Atractiveness / Business Case

GATE 1

Gate 1: CPP

Conceptual design

GATE 2

Gate 2: CDP com CPP

Preliminary project

GATE 3

Gate 3: CDP

Detailed project

GATE 4

Gate 4: CEO

Manufacturing Preparation

Preparing to Launch

Launch

After sales

CPP: Product Portfolio Committee
CDP: Product Development Committee
CEO: Operational Specifications Committee

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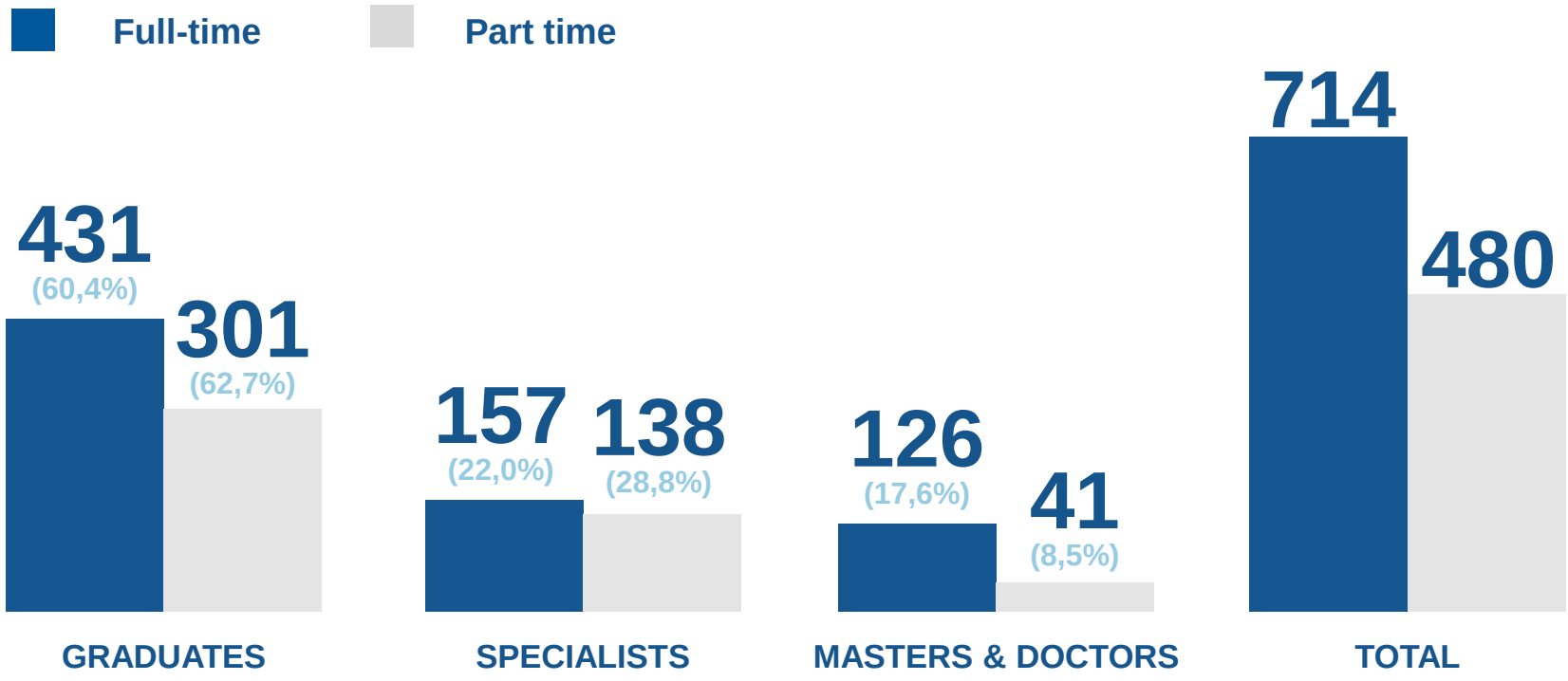
R & D Engineers - WEG Group



December 2016
Brazil

Total Engineers: 2,734
1,520 in Brazil
1,214 Abroad

Employees dedicated to R & D: 2319
Full time: 1,290
Part-time: 929

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Global presence

Factories

Head office

Distributors in 90 countries

Branches in 30 countries

Total Employees: 29,325
Total abroad: 9,111
03/31/2017

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Organization for Innovation - WEG Group

Research, development and product customization centers

MOTORS

R & D of global platforms for industrial motors
R & D of Appliance motors (shared / collaborative with Changzhou)
ECM motor R & D (shared / collaborative with Blufton)
PM Engine R & D
R & D of electric drive motors
R & D of motor monitoring systems
Cestari: Gearbox R & D

ENERGY

R & D of Induction Motors and Synchronous Machines
Wind turbine R & D (shared / collaborative with USA)

TRANSMISSION & DISTRIBUTION

Product customizations
R & D for Switchers
R & D for Mobile Solutions
Transformers Monitoring Systems R & D
R & D of global platforms for Power, Medium-Power, Dry and Distribution transformers.

AUTOMATION

Research and development of global products of drives, controls, nobreaks, machine safety, sensors, building technology, solar, electric mobility, energy storage systems, panels and electrocenters.

PAINTS

R & D of liquid paints,
R & D powder inks,
R & D resins and electroisolants

MOTORS

Product customizations

AUTOMATION

Customizing panels

PAINTS

Formulation customization

AUTOMATION

Customizing panels and electrocenters

TRANSMISSION & DISTRIBUTION

Product customization
Dry Transformers R & D
Encapsulated Dry Transformers R & D
R & D of new product design process

Organization for Innovation - WEG Group

Research, development and product customization centers

MOTORS AND ENERGY

Blufton: R & D of global platforms for commercial motors and ECM (2018 / shared / collaborative with Brazil)
WEM: R & D 2p Turbo Generators
R & D of synchronous machine monitoring systems
WEG Wind USA: Wind Turbine R & D (Shared / collaborative with Brazil)

AUTOMATION

Customization of drives and panels solutions for the North American market.

MOTORS AND ENERGY

R & D of product lines for adaptation to the industrial market and Product customizations

AUTOMATION

Panel development engineering center for the North American market.

TRANSMISSION & DISTRIBUTION

Product customizations
R & D of the new Medium Voltage Line
R & D of mechanical design of Medium Voltage transformers
(PSW)

Organization for Innovation - WEG Group

Research, development and product customization centers

MOTORS AND ENERGY

KATT: R & D of high-speed motors and motor test products.
WATT: Reducer Platforms R & D

AUTOMATION

Research of solar inverters and products & certifications of line of machines safety.

MOTORS AND ENERGY

R & D of motor platforms for unsafe areas Development of product lines to suit the market.

AUTOMATION

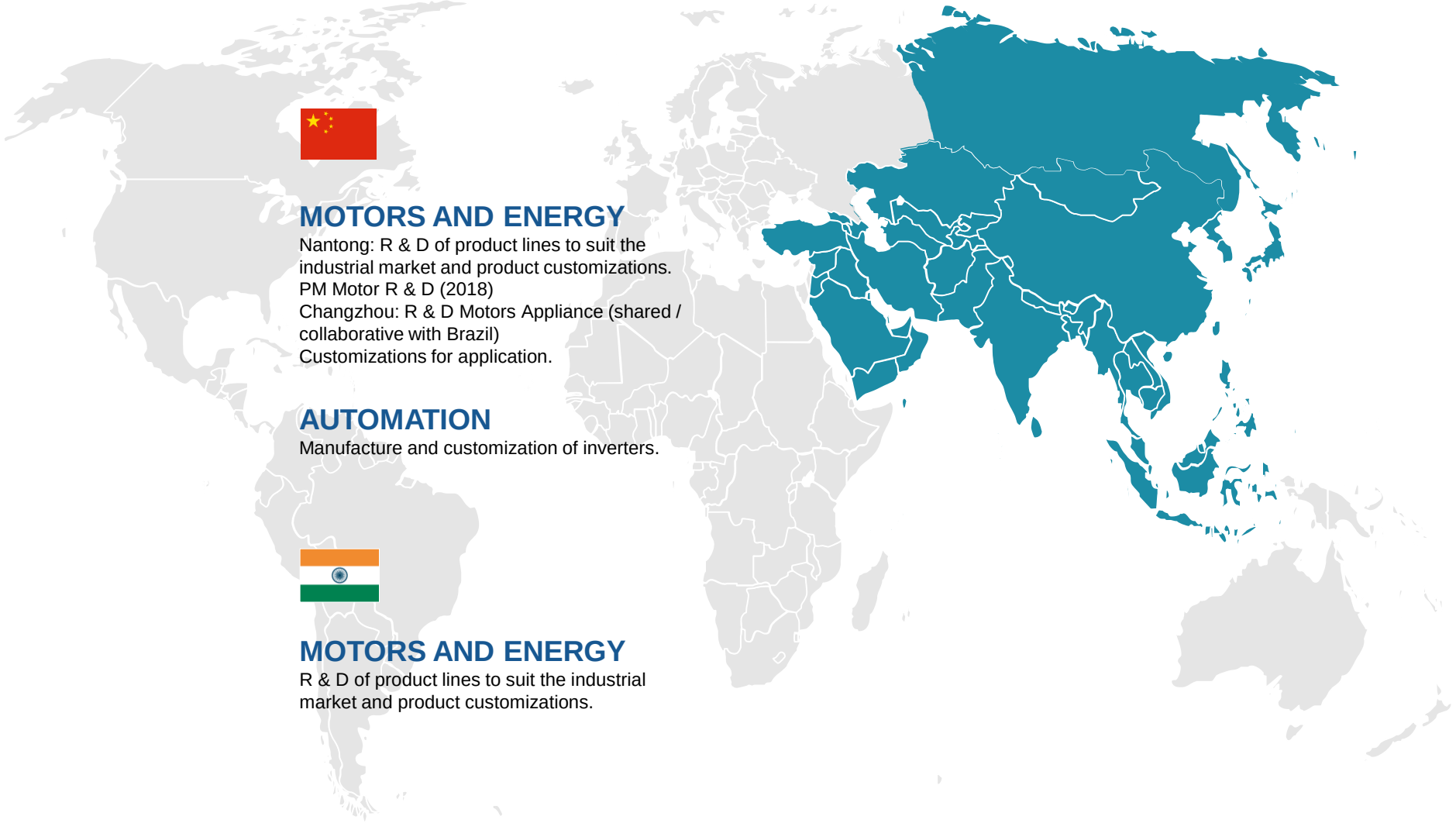
Mounting of medium voltage drives to meet the European market.

AUTOMATION

Customization of LV panels for the European market

Organization for Innovation - WEG Group

Research, development and product customization centers



MOTORS AND ENERGY

Nantong: R & D of product lines to suit the industrial market and product customizations.
PM Motor R & D (2018)
Changzhou: R & D Motors Appliance (shared / collaborative with Brazil)
Customizations for application.

AUTOMATION

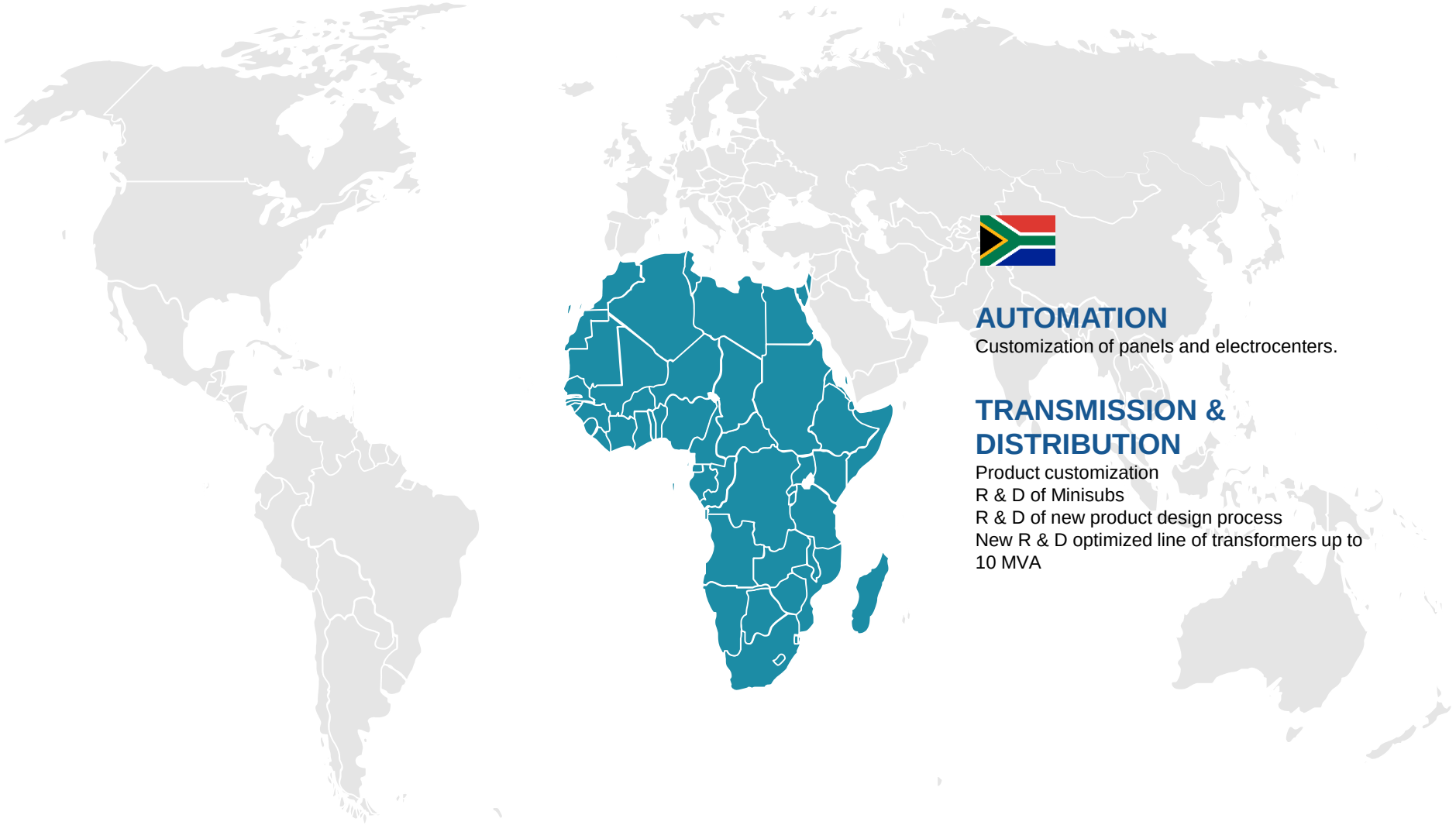
Manufacture and customization of inverters.

MOTORS AND ENERGY

R & D of product lines to suit the industrial market and product customizations.

Organization for Innovation - WEG Group

Research, development and product customization centers



AUTOMATION

Customization of panels and electrocenters.

TRANSMISSION & DISTRIBUTION

Product customization
R & D of Minisubs
R & D of new product design process
New R & D optimized line of transformers up to 10 MVA

Partnerships

Universities

BRAZIL

UNIVERSIDADE FEDERAL DE SANTA CATARINA

UFRGS
UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL

UFRJ

FURB
UNIVERSIDADE REGIONAL DE BLUMENAU

USP

UTFPR

UNICAMP

unesp

Católica de Santa Catarina
Centro Universitário

UNIVALI
UNIVERSIDADE DO VALE DO ITAJAÍ

UFCG

UFMG

Universidade Federal de Santa Maria
1960

ABROAD

Hannover, Wuppertal, Braunschweig, Aachen e Freiburg

Wisconsin, Texas e Georgia

Berna e Zurique

Manchester, Nottingham e Glasgow

Laval e McMaster (Hamilton)

OUTROS

Estocolmo, Nova Delhi, Coimbra, Graz (Áustria)

Scientific and Technological Committee | **1st Meeting: 1998**

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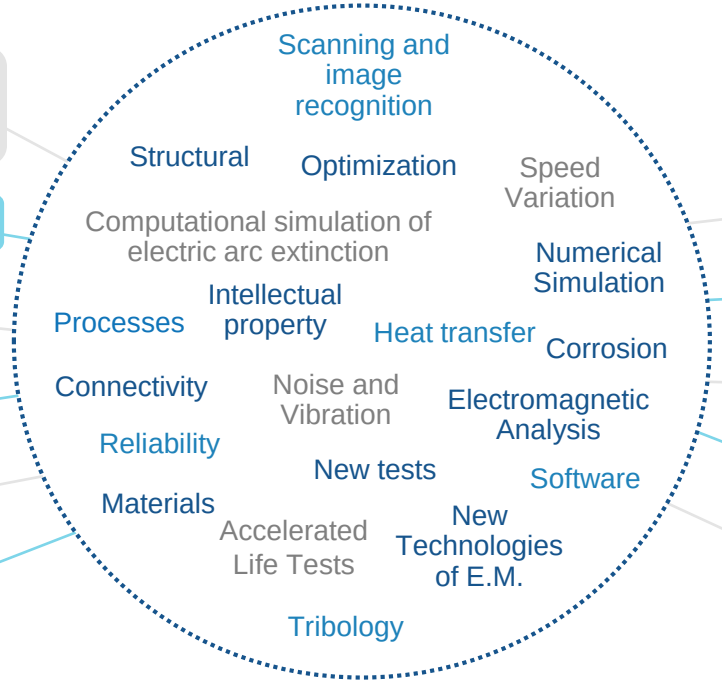
WEG Competence Groups

Research Topics

- Precision mechanics and technology of electrical contacts
- Electric and Magnetic Materials
- Insulation Systems
- Polymeric Materials
- Variable speed drives
- Fluid-Thermo-Acoustics



- Structural analysis
- Vibrations
- Electromagnetic Analysis
- Industrial Property
- Bearings

Focus

PERFORMANCE, COST, TIME TO MARKET

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Competitive intelligence

Technological Prospecting

Benchmarking

Evaluation of competition and the market

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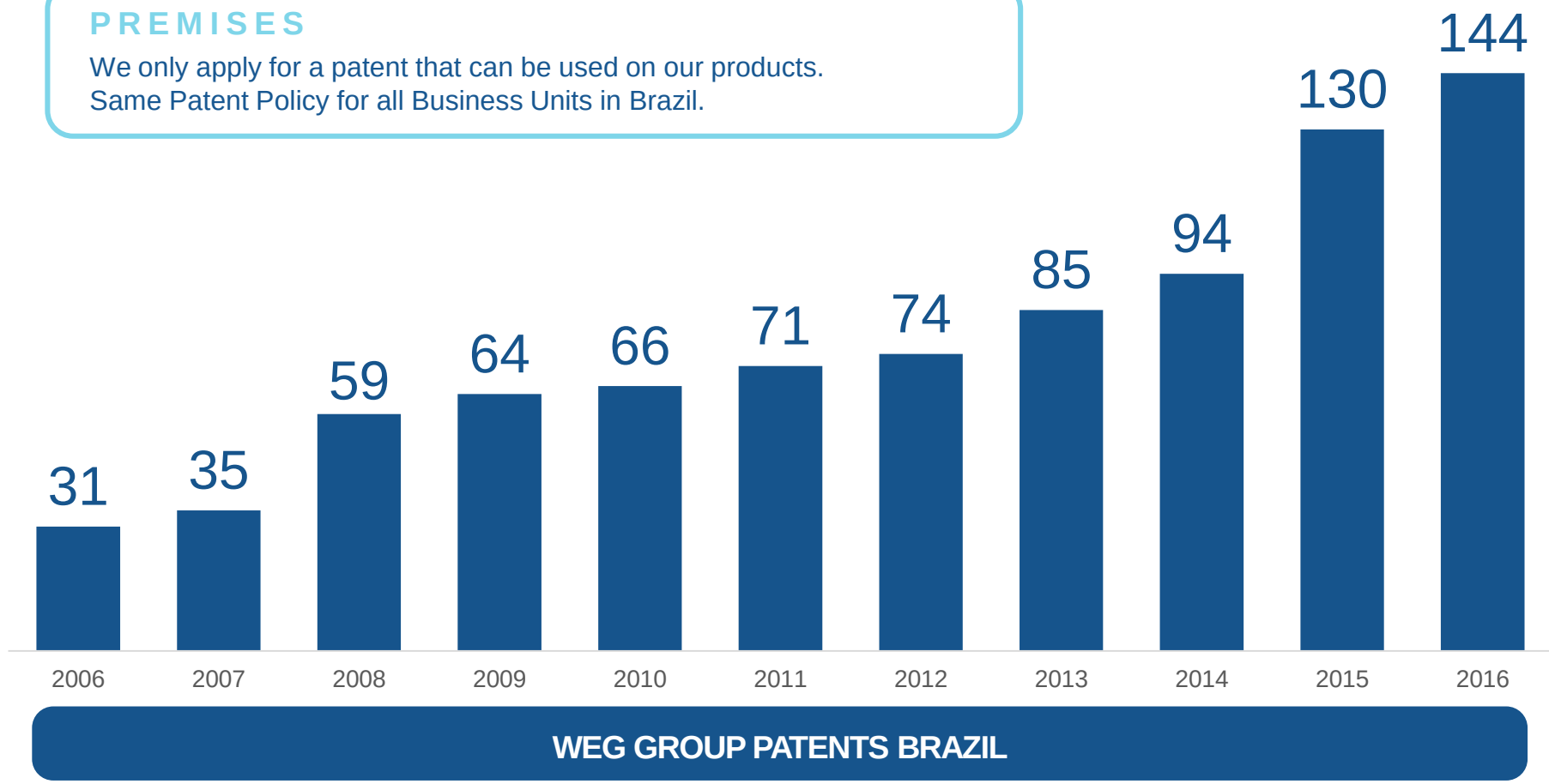
Patent Policy

PREMISES

We only apply for a patent that can be used on our products.
Same Patent Policy for all Business Units in Brazil.



Patents granted or pending

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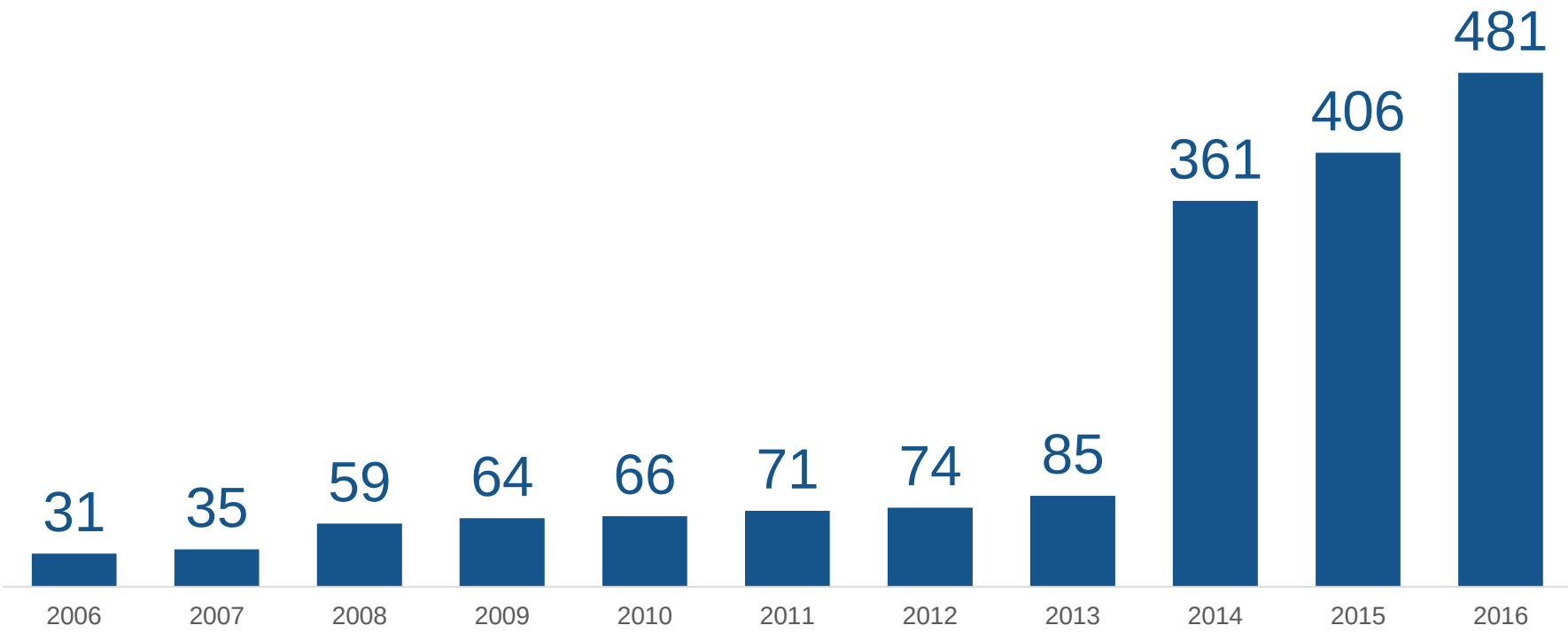
Patents



WEG GLOBAL GROUP PATENTS

Patents granted or pending

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Financing source

Own resources

BNDES

Finep
INOVAÇÃO E PESQUISA

Lei do Bem
(Brazilian law)

Specific edicts

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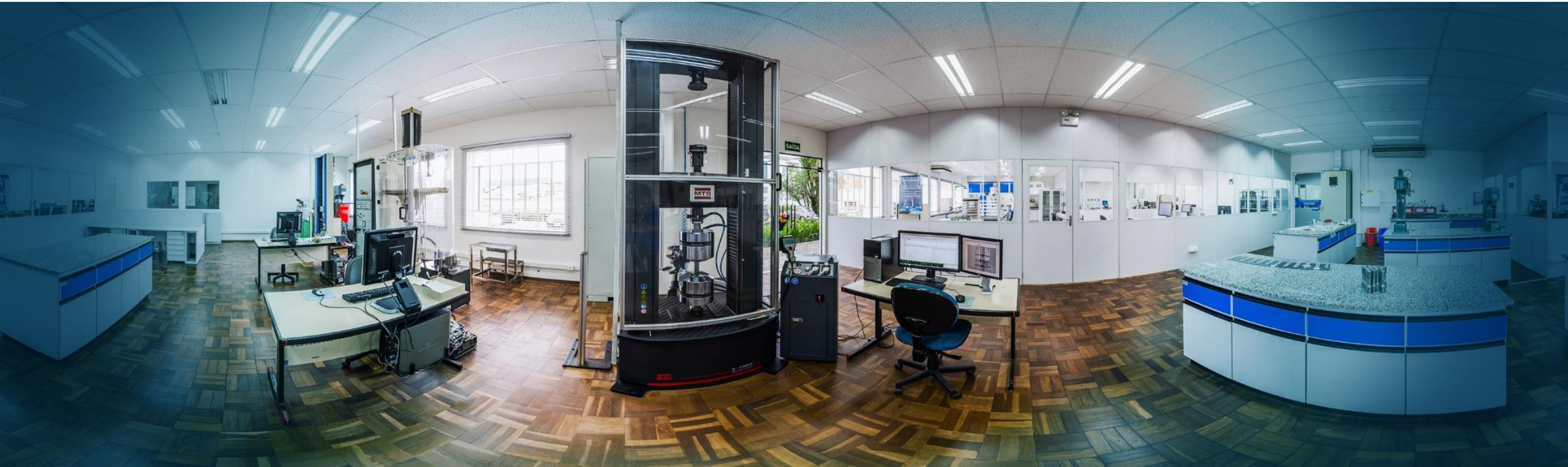
Laboratory Structure - Motors

- Chemistry
- Mechanical Testing
- Insulating Materials
- High voltage
- Electric and Magnetic Materials
- Electric Motor Testing
- Control and Instrumentation
- Fluid-Thermal-Acoustics
- Vibration



Laboratory Structure - Energy

- Devices and components testing
- Electronics
- Insulation Systems (LSI)

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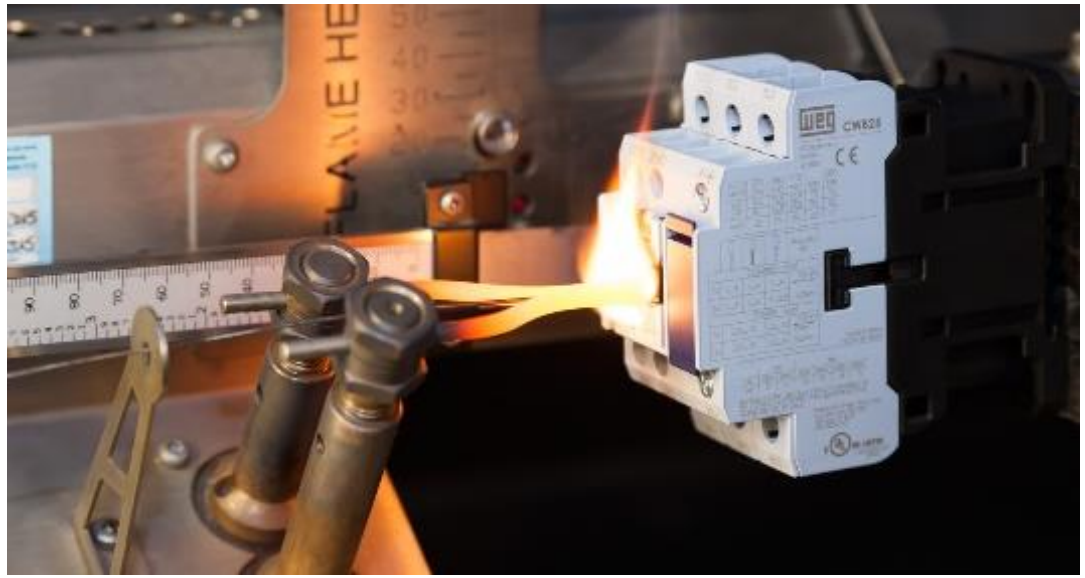
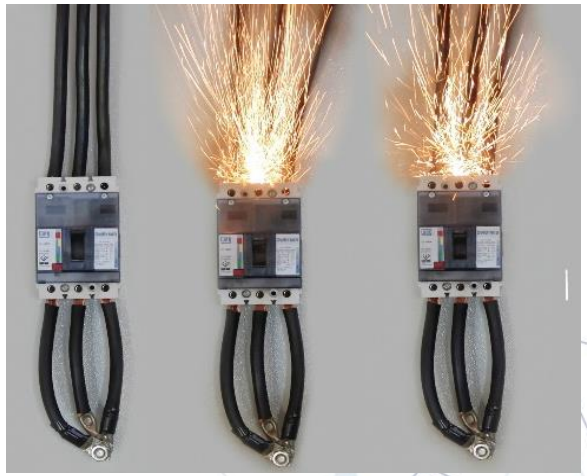
Laboratory Structure - Automation

- Short circuit
- Electrical durability
- EMC (Electromagnetic Compatibility)
- Temperature rise
- Panel Testing
- Low power tests
- Dielectric and impulse
- Dynamometer tests
- Degree of protection





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Laboratory Structure - T & D

- High Voltage Testing
- Mobile Laboratory

Laboratory Structure - Paints

- Liquid Coatings Development Laboratory
- Powder Coatings Development Laboratory
- Laboratory for Electroinsulating Resins and Varnishes Development
- Corrosion
- Accelerated Weathering
- Application

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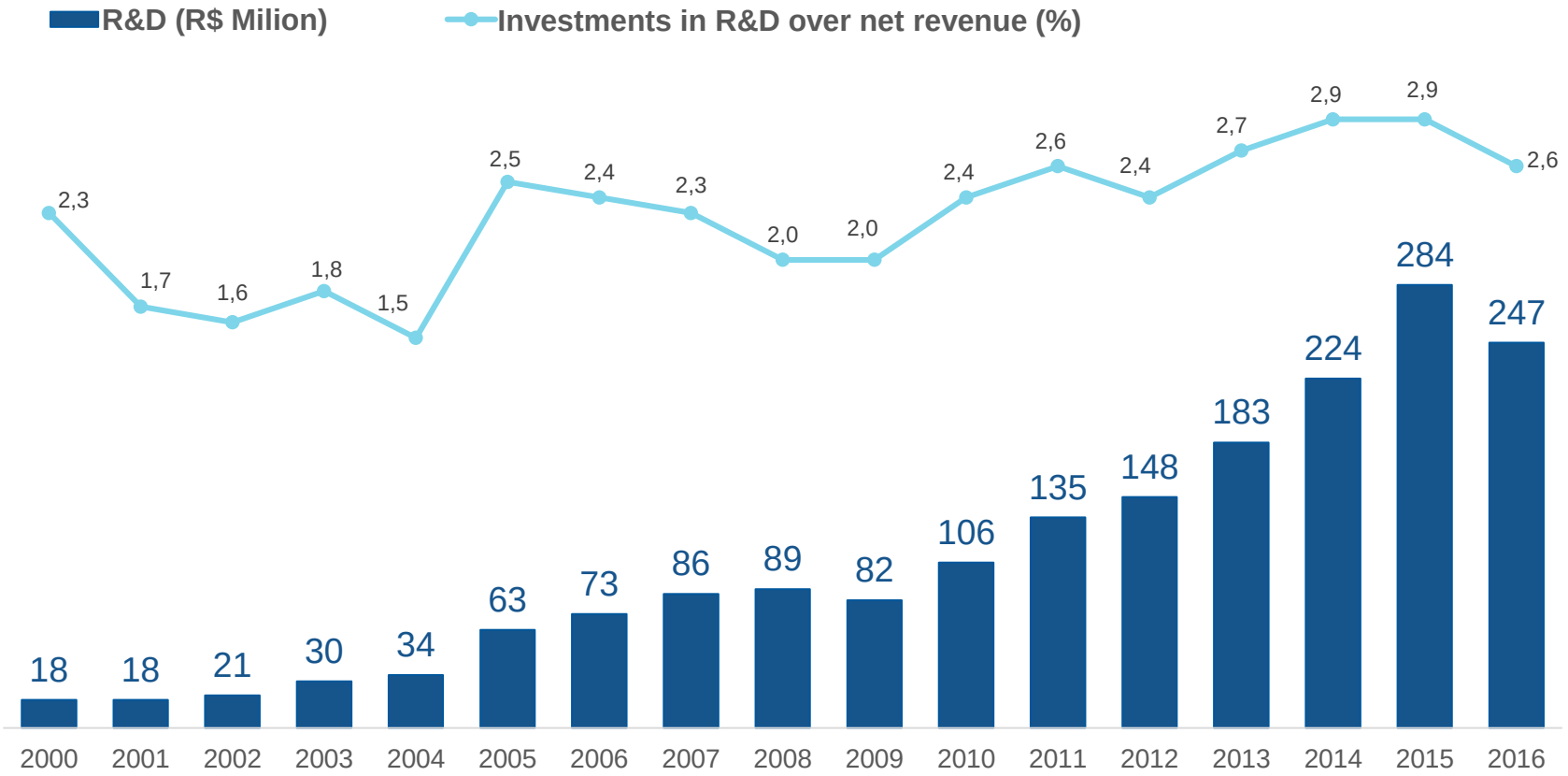
Investments in R&D



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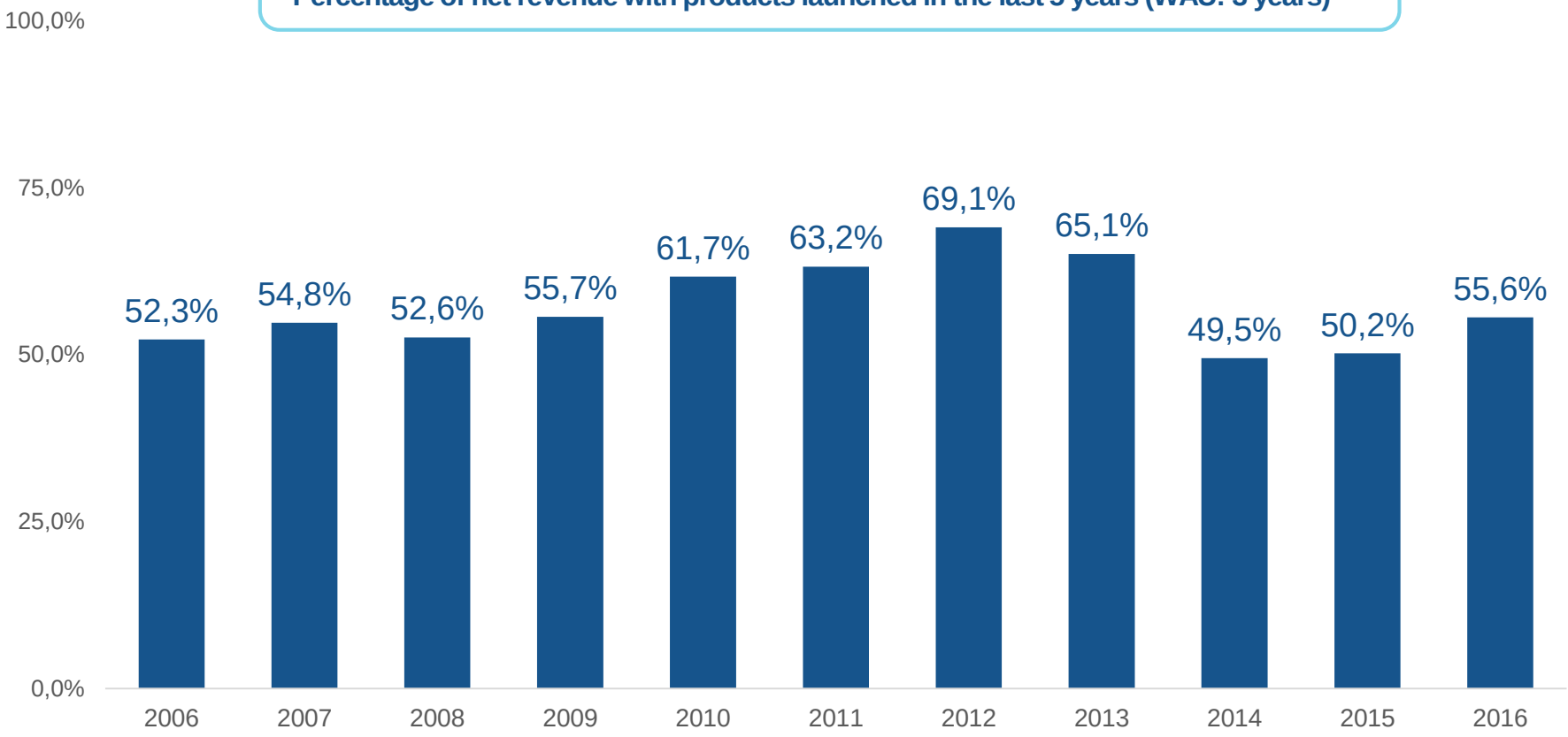
Innovation index

Innovation as a percentage of net revenue

Percentage of net revenue with products launched in the last 5 years (WAU: 3 years)



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Awards of Innovation

2011 - 2012 - 2013 - 2015

BEST INNOVATOR

Organized by: Negócios ATKearney

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Awards of Innovation

2011 - 2012 - 2013 - 2014

Prêmio Finep

Organized by: Finep INOVAÇÃO E PESQUISA

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Awards of Innovation

2012 - 2013

Prêmio Nacional de Inovação

Organized by: CNI SESI SENAI IEL CNI

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Awards of Innovation

2015 - 2016

Organized by: pwc strategy& Valor Econômico

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Technological
Evolution
weg
DAY
2017

Electric Motor Evolution

* 20% less losses compared to IE4 (IE5 not yet included in the IEC standard)

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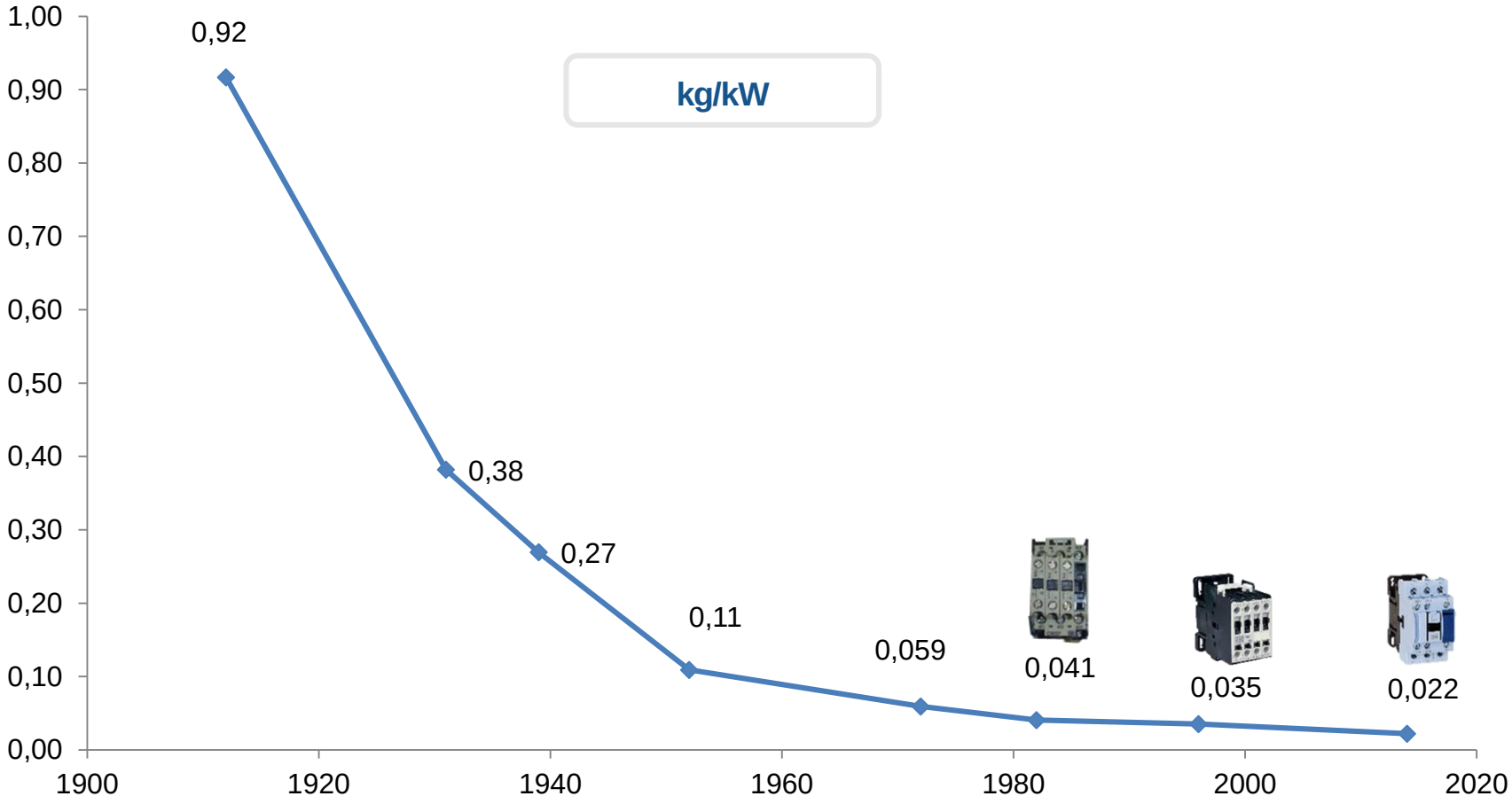
Contactor Evolution



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Evolution - Efficiency of the W22 Platform

Ref: Motor 60HP 4p

IE5

2016
W22 WMagnet Ultra Premium: 96.5%

IE4

2013
W22 Super Premium: 95.8%

IE4

2010
WMagnet: 96.0%

IE3

2010
W22 Premium: 95.1%

IE2

2000
W21 AR Plus: 93.9%

1990
Efficiency: 90.2%

1980
Efficiency: 89.5%

1960
Efficiency: 88%

*20% less losses compared to IE4
(IE5 is not yet included in the IEC standard)

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Frequency Inverter Evolution

General use

1985
CFW-I
1st GENERATION

Analogic technology with thyristors

1991
CFW-01
2nd GENERATION

Hybrid technology with bipolar transistors

1993
CFW-03
3rd GENERATION

Digital technology with bipolar transistors

1995/96
CFW-05/06
4th GENERATION

Technology with vector control and IGBT transistors

2000
CFW-09
5th GENERATION

Technology with communication networks and surface-mounted components (SMD)

2008
CFW-11
6th GENERATION

Technology with filters and PLC function.

2010
CFW700
7th GENERATION

Technology with resources for OEMs

2013
CFW701 HVAC
8th GENERATION

Technology with facilities for building automation

2018
CFW900
9th GENERATION

Technology with security functions and IoT (Internet of Things)

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Frequency Inverter Evolution

Micro / Mini Drives

1985
CFW-U
1st GENERATION

Analogic technology with thyristors

1989
CFW-P
2nd GENERATION

Analogic technology with bipolar transistors

1992
CFW-02
3rd GENERATION

Digital technology with bipolar transistors

1995
CFW-04
4th GENERATION

Digital technology with IGBT transistors

1997
CFW-07
5th GENERATION

Surface Mount Technology (SMD)

1999/2001
Microline/CFW-08
6th GENERATION

Technology with sensorless control and built-in filter

2004
CFW-10
7th GENERATION

DSP control technology

2012
CFW100
8th GENERATION

Technology with IPM module and reduced dimensions.

2012
CFW50
9th GENERATION

Technology with Ethernet and PLC function

2013
CFW501 HVAC
10th GENERATION

Technology with facilities for building automation

2016
CFW300
11th GENERATION

Technology with WPS programming system

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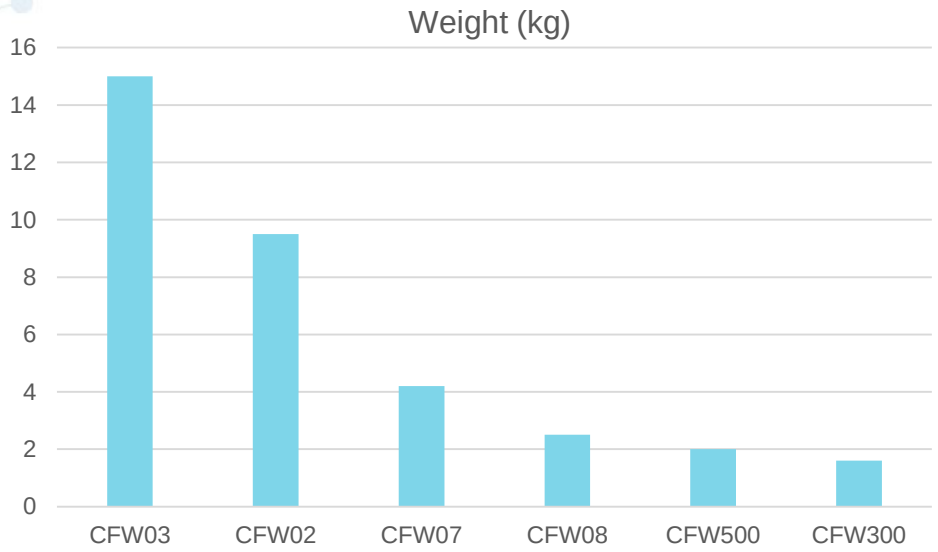
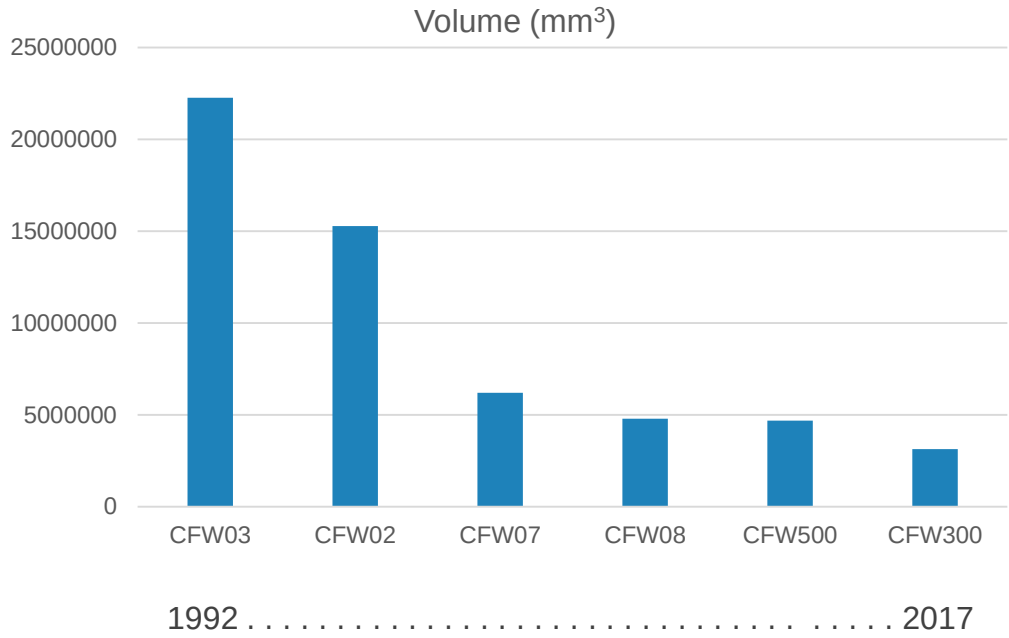
Evolution of Inverters - Example 7.5 HP





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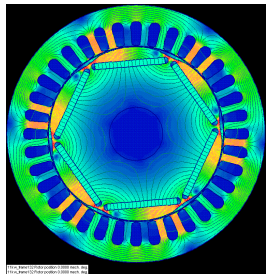
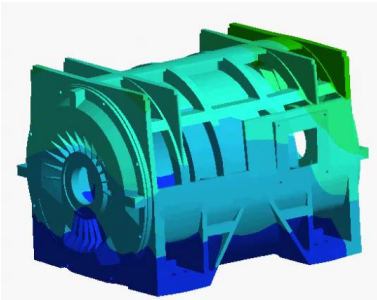
Evolution - Analysis by Computational Tools

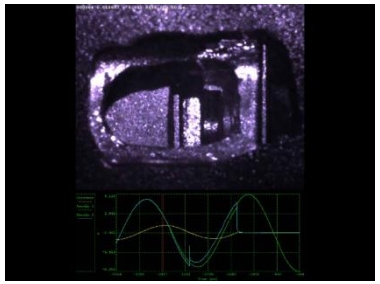
Electromagnetic analysis



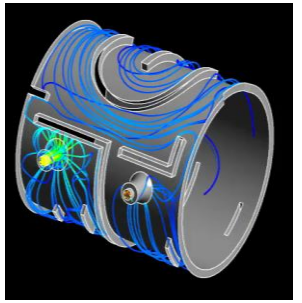
Natural frequency



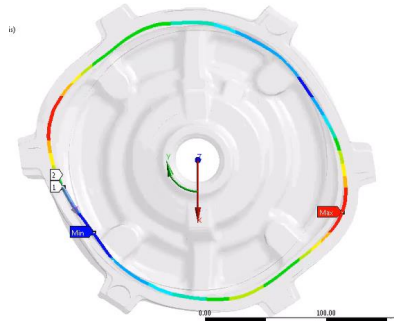
Electric arc recording



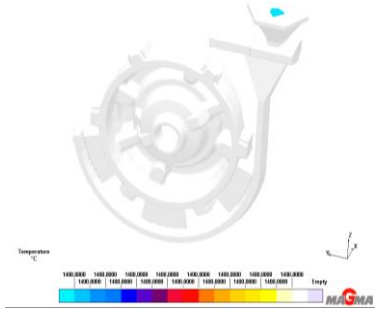
Water flow



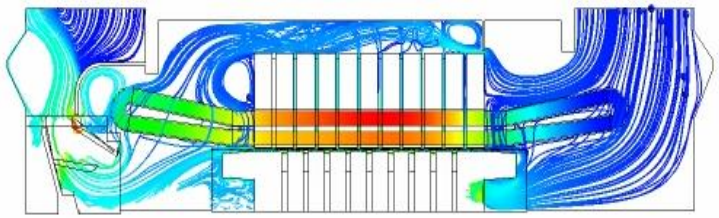
Structural analysis



Metal flow



Air flow



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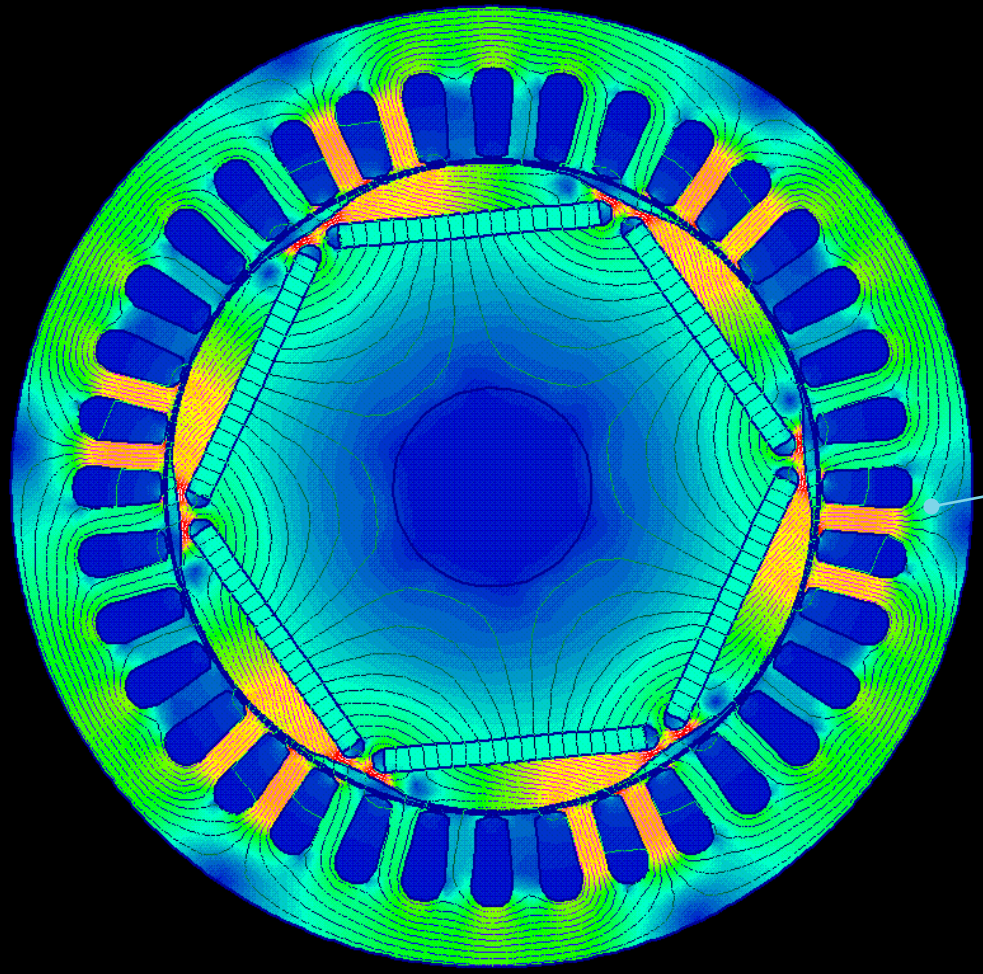
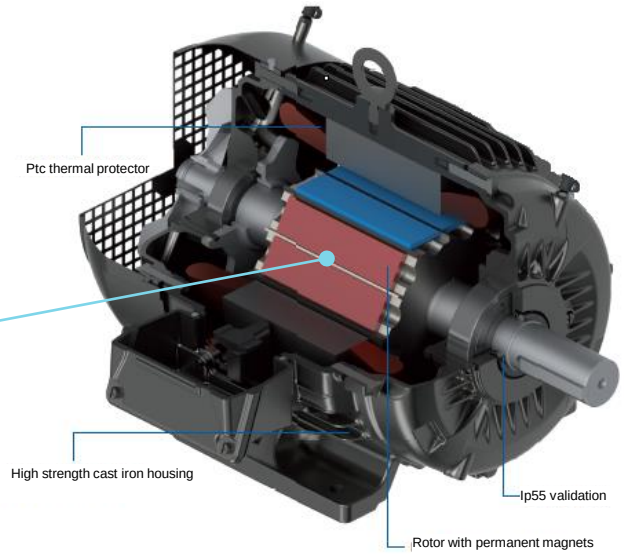
Evolution - Analysis by Computational Tools



11kw_frame132 Rotor position 0.0000 mech. deg.

ELECTROMAGNETIC ANALYSIS



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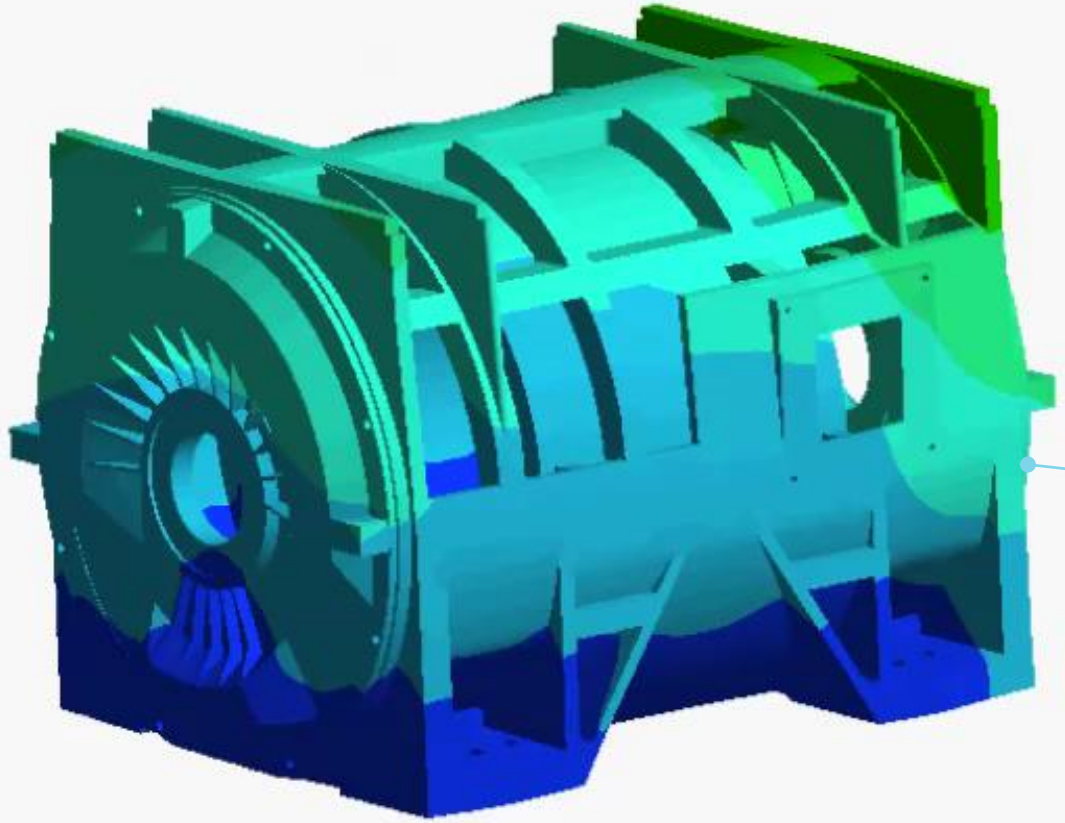
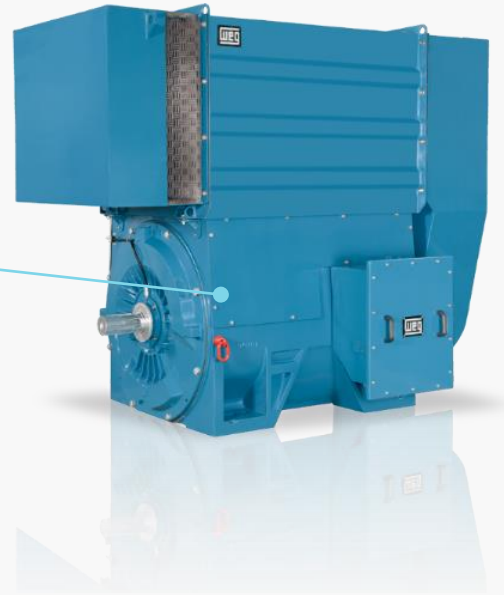
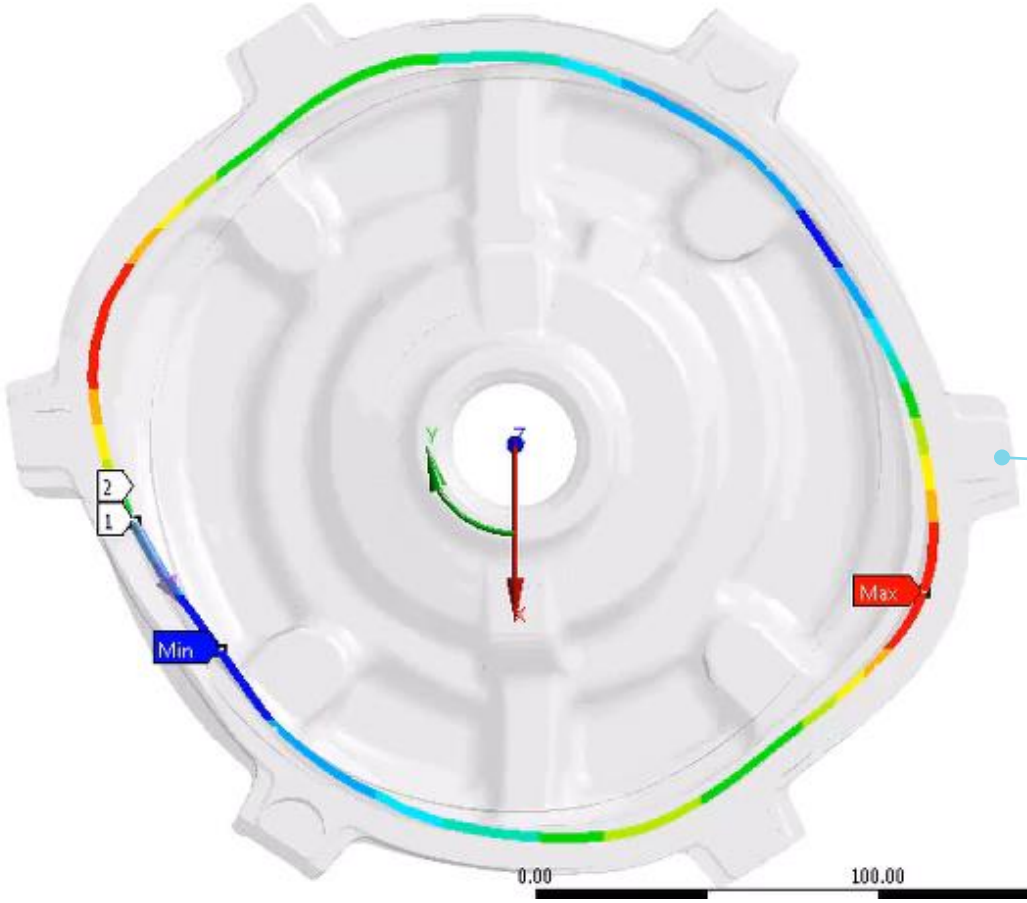
Evolution - Analysis by Computational Tools

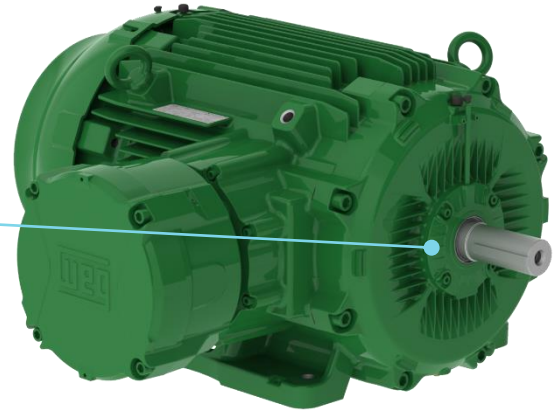




NATURAL FREQUENCY

Evolution - Analysis by Computational Tools

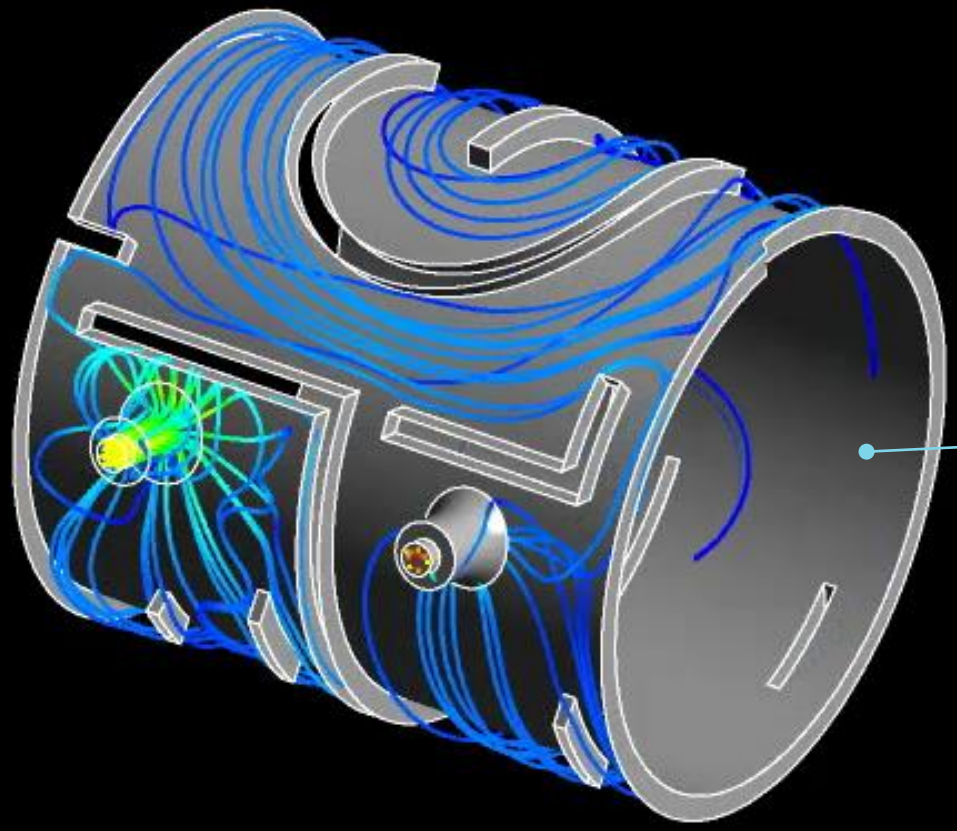




STRUCTURAL ANALYSIS

WEG DAY 2017

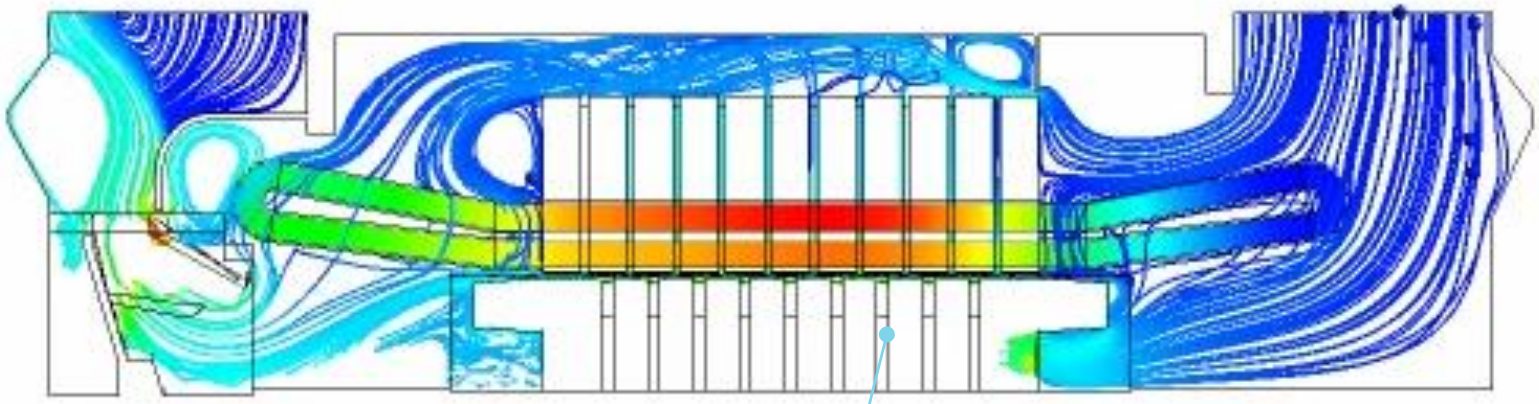
Evolution - Analysis by Computational Tools

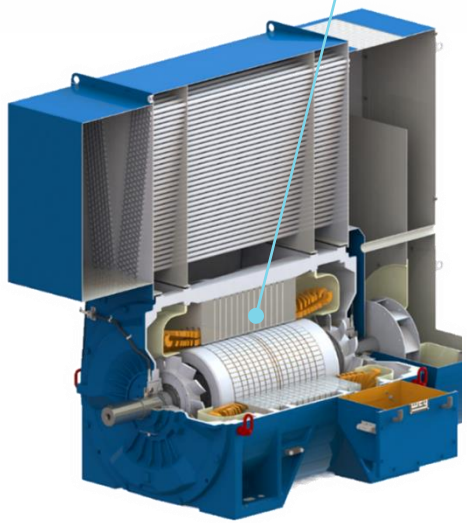


WATER FLOW

WEG DAY 2017

Evolution - Analysis by Computational Tools

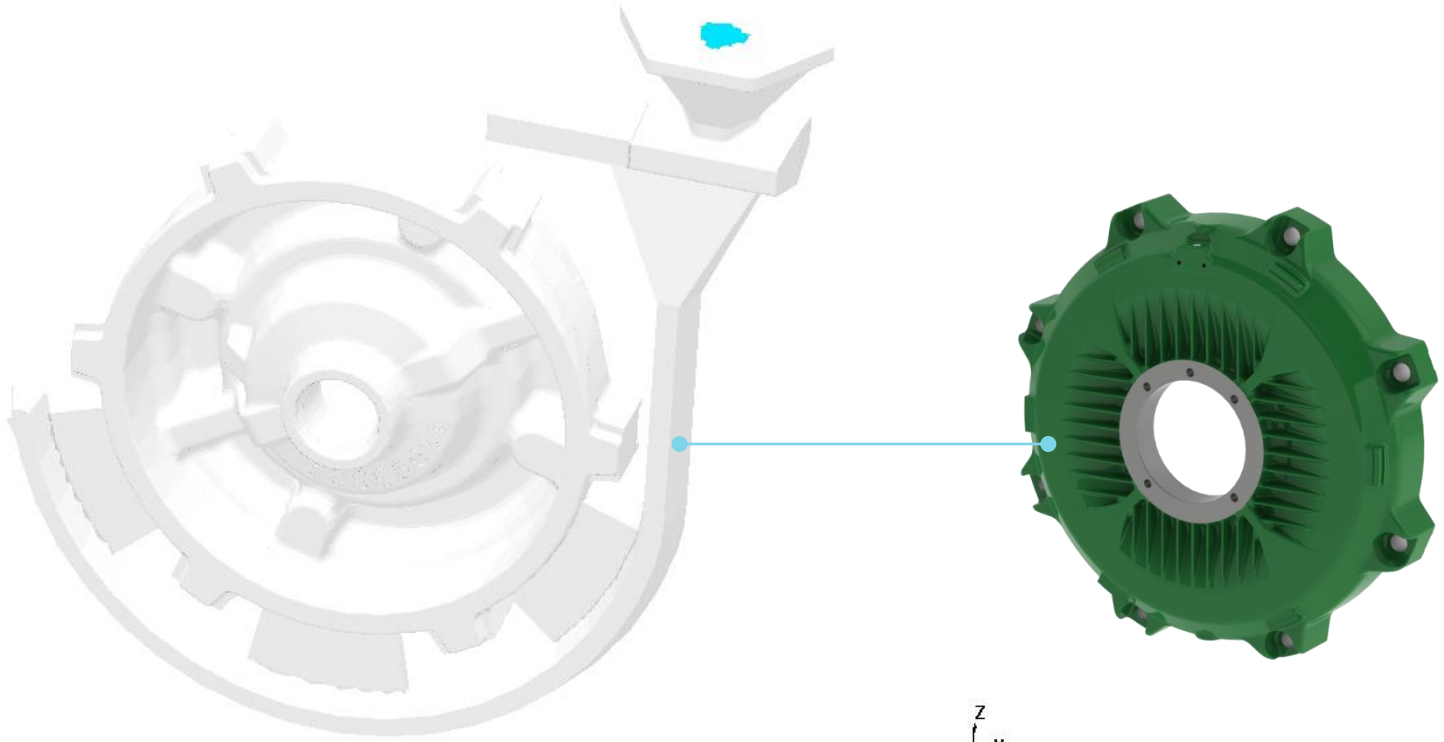




AIR FLOW

WEG DAY 2017

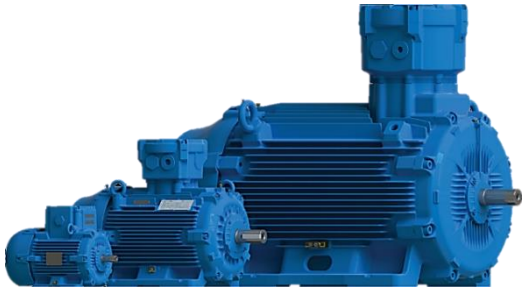
Evolution - Analysis by Computational Tools

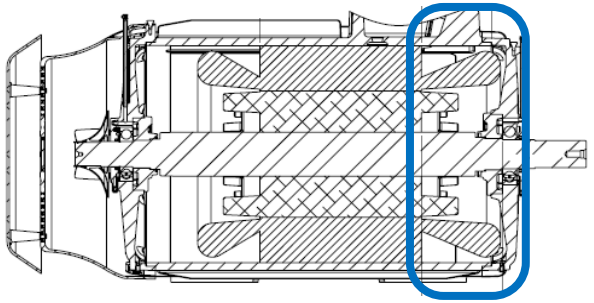


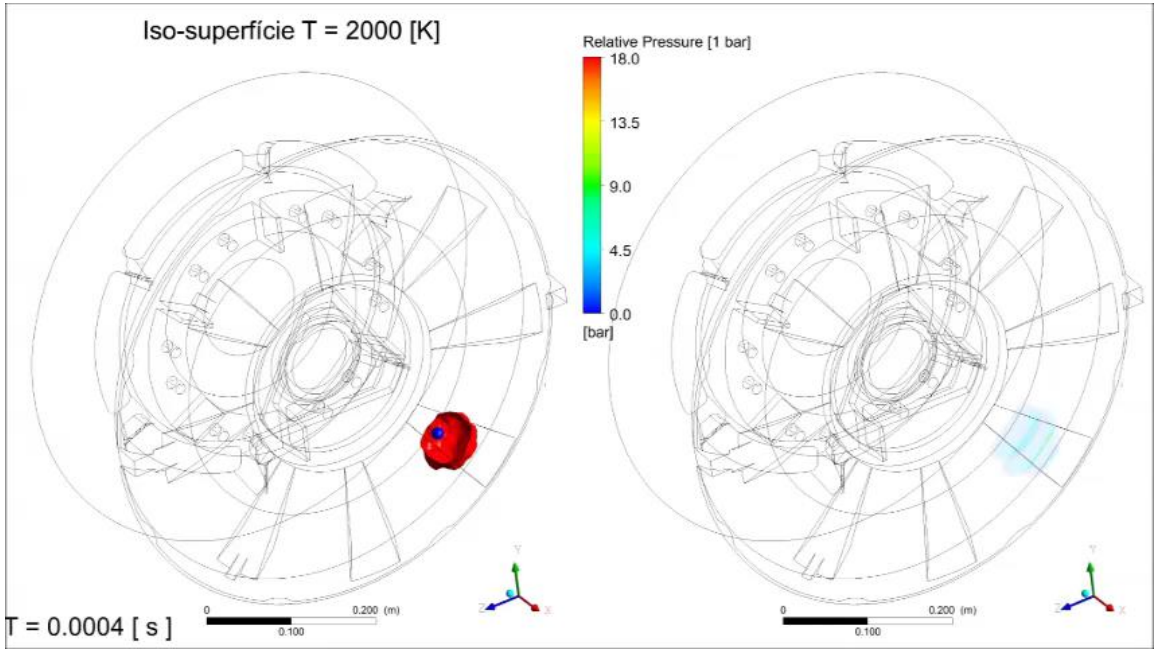
METAL FLOW

WEG DAY 2017

Evolution - Analysis by Computational Tools







INTERNAL EXPLOSION IN ELECTRIC MOTOR

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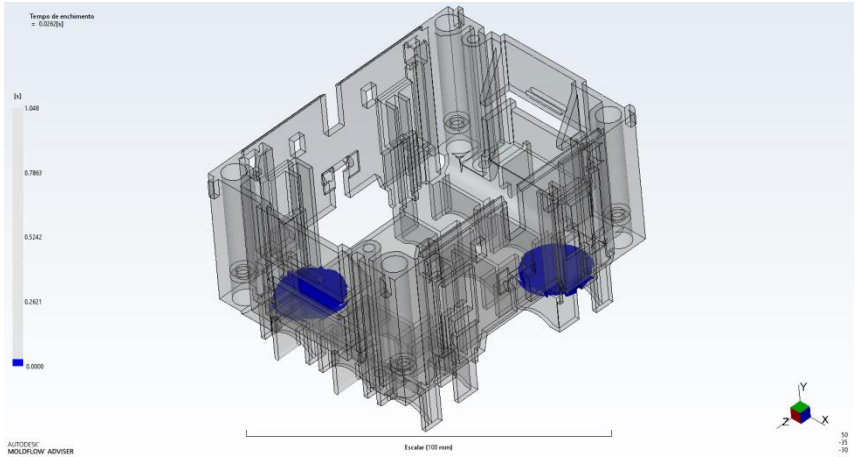
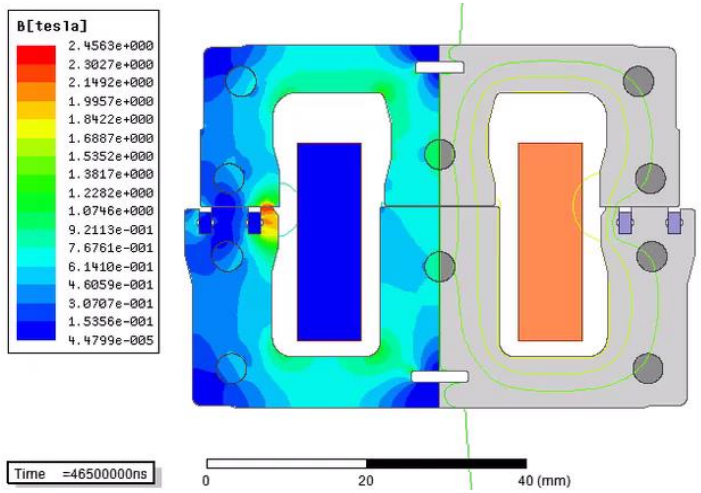
Evolution - Analysis by Computational Tools

Plastic Injection Simulations



Electromagnetic simulation of contactor core



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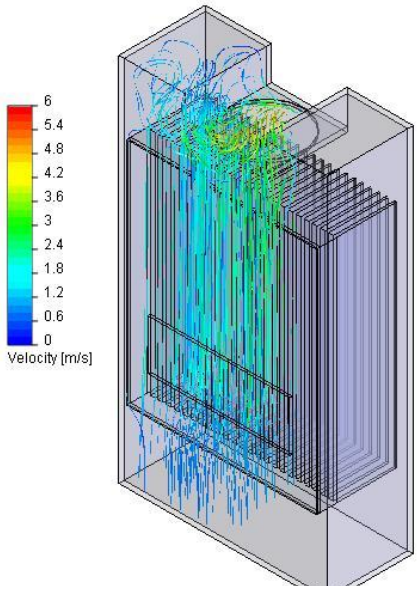
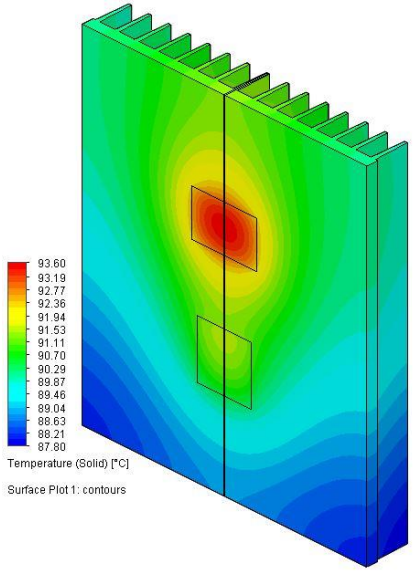
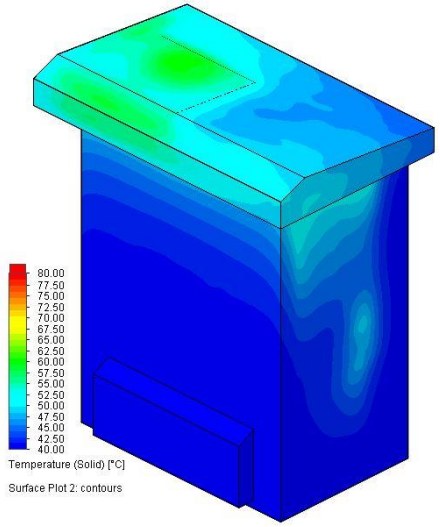
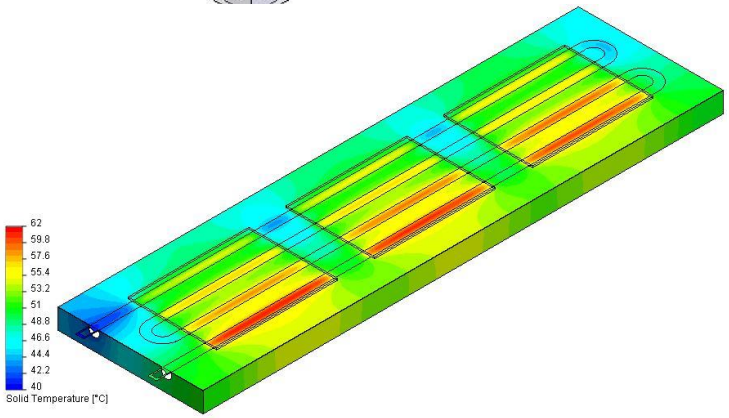
Evolution - Analysis by Computational Tools

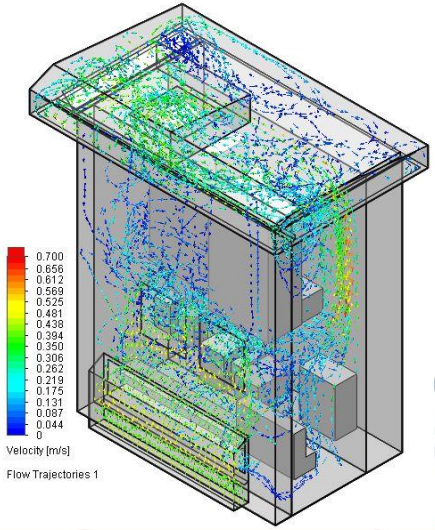
Natural and Forced Convection. Air and Water Heat Flow











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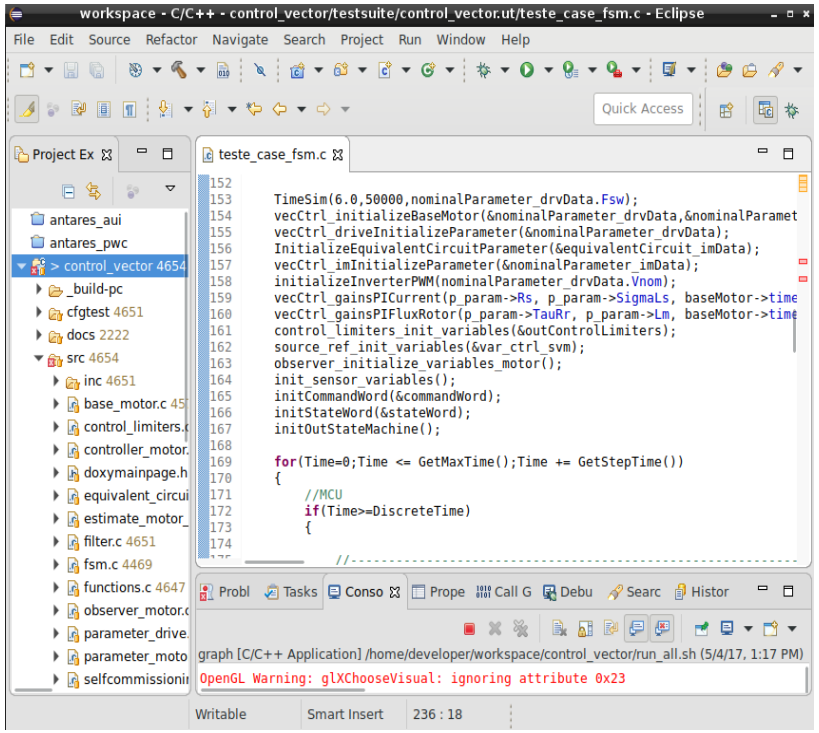
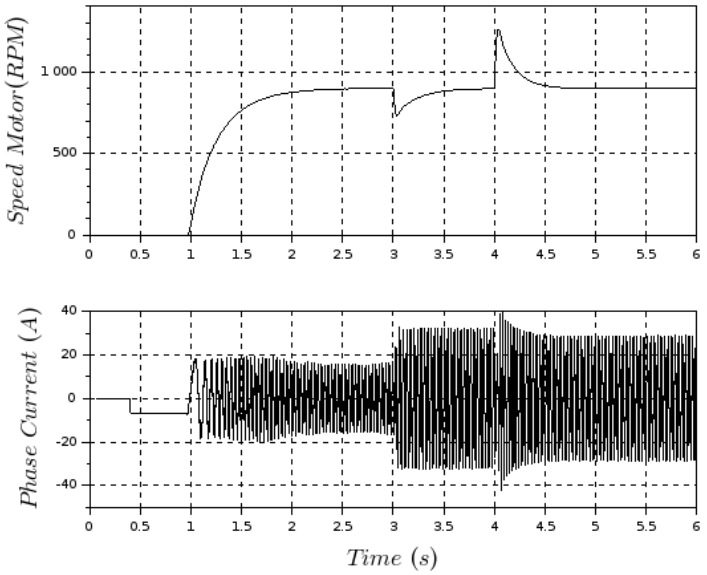
Evolution - Analysis by Computational Tools

Eclipse Development Software

Motor Control





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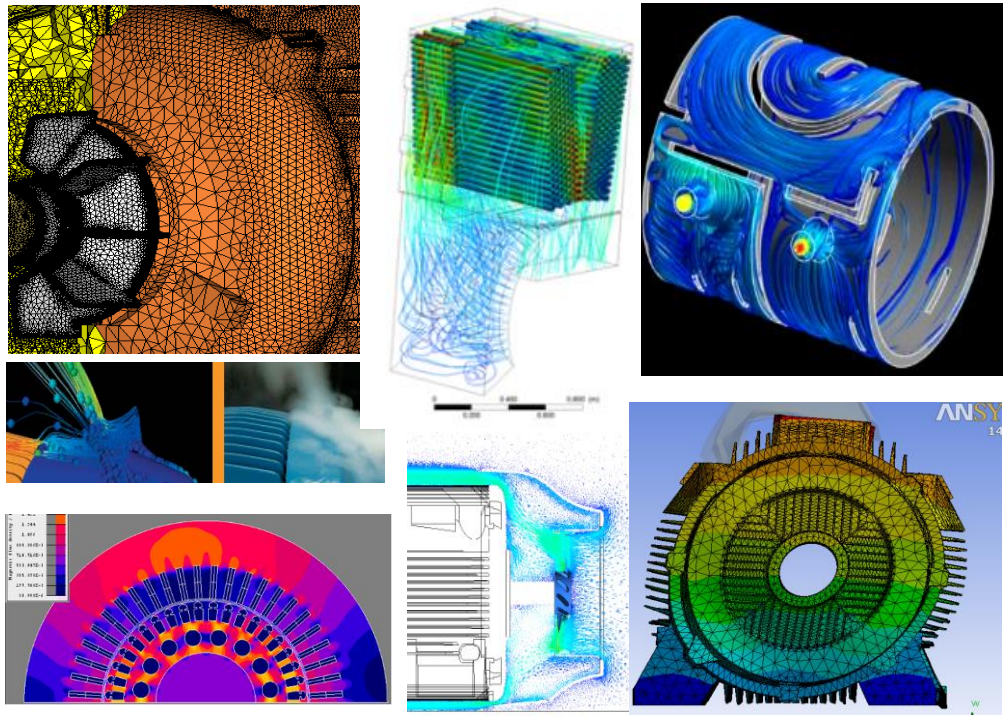
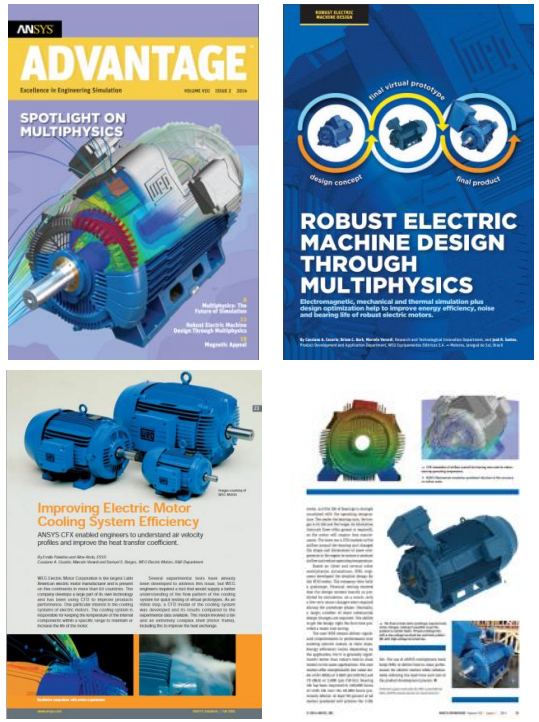
Evolution - Virtual Prototypes





International Awards

2005
four/month

2017
Over
1000/month

Number of simulations

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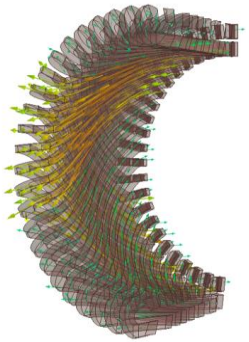
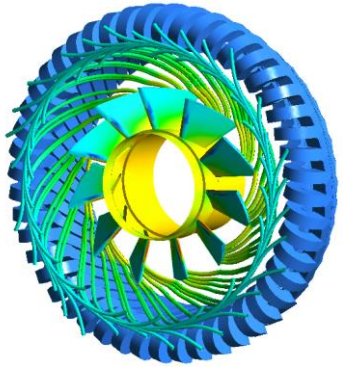
Evolution - Virtual Prototypes

One Physics Environment

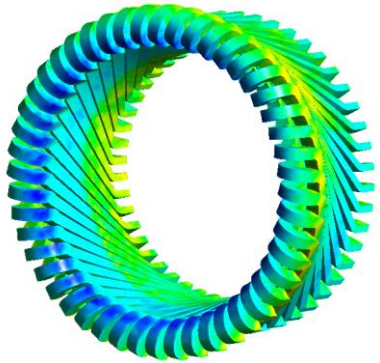
Electromagnetics

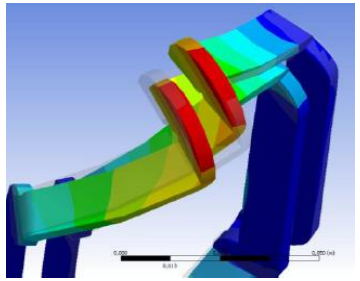


Fluids

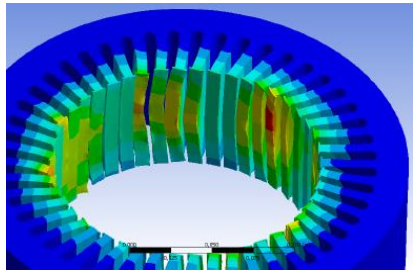


Thermal

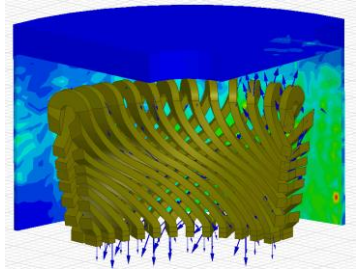




Structural



Dynamics



Thermal - Electromagnetics

One Physics Environment allows the overlap of engineering knowledge areas creating opportunities for innovation.

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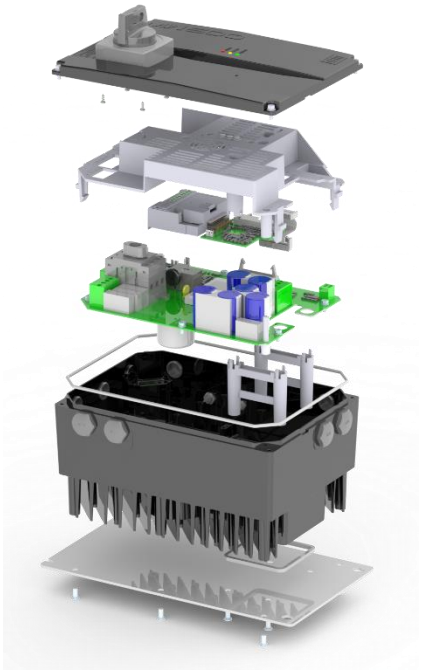
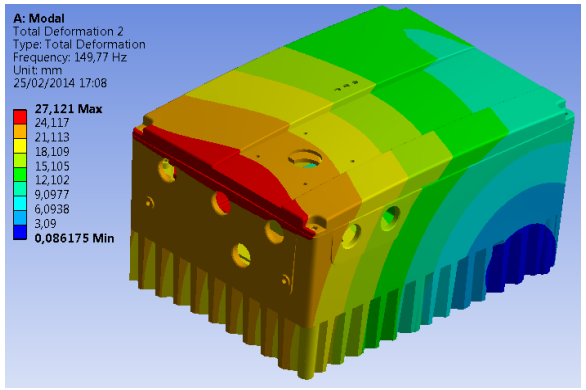
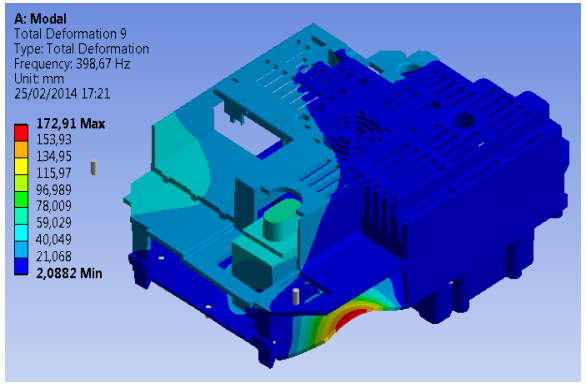
Evolution - Virtual Prototypes

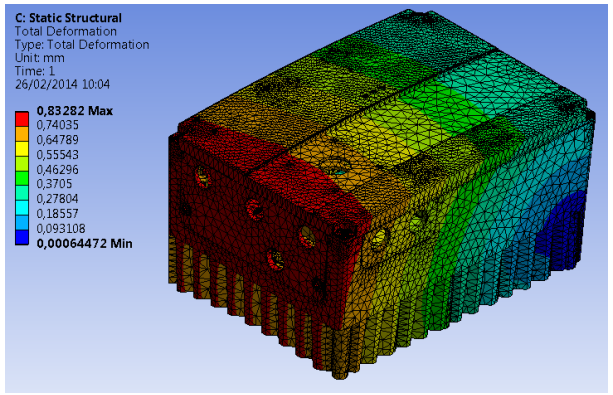


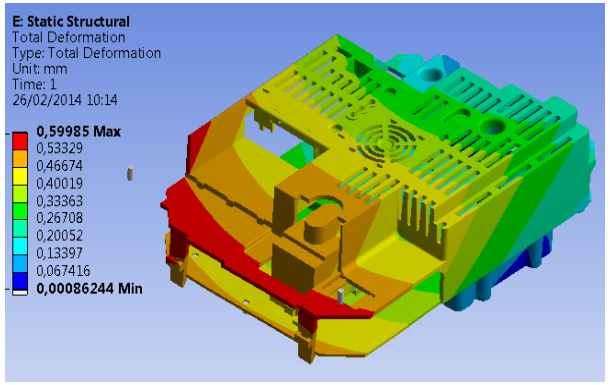
Modal Analysis

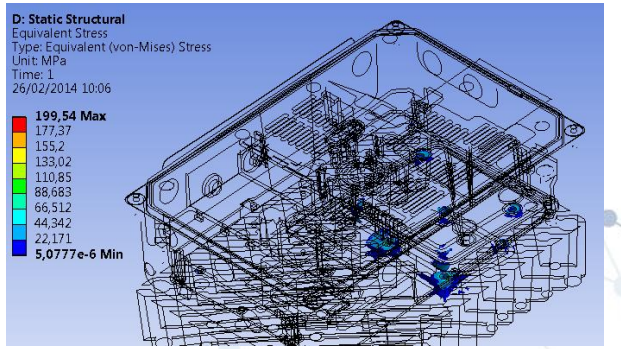




Structural Analysis







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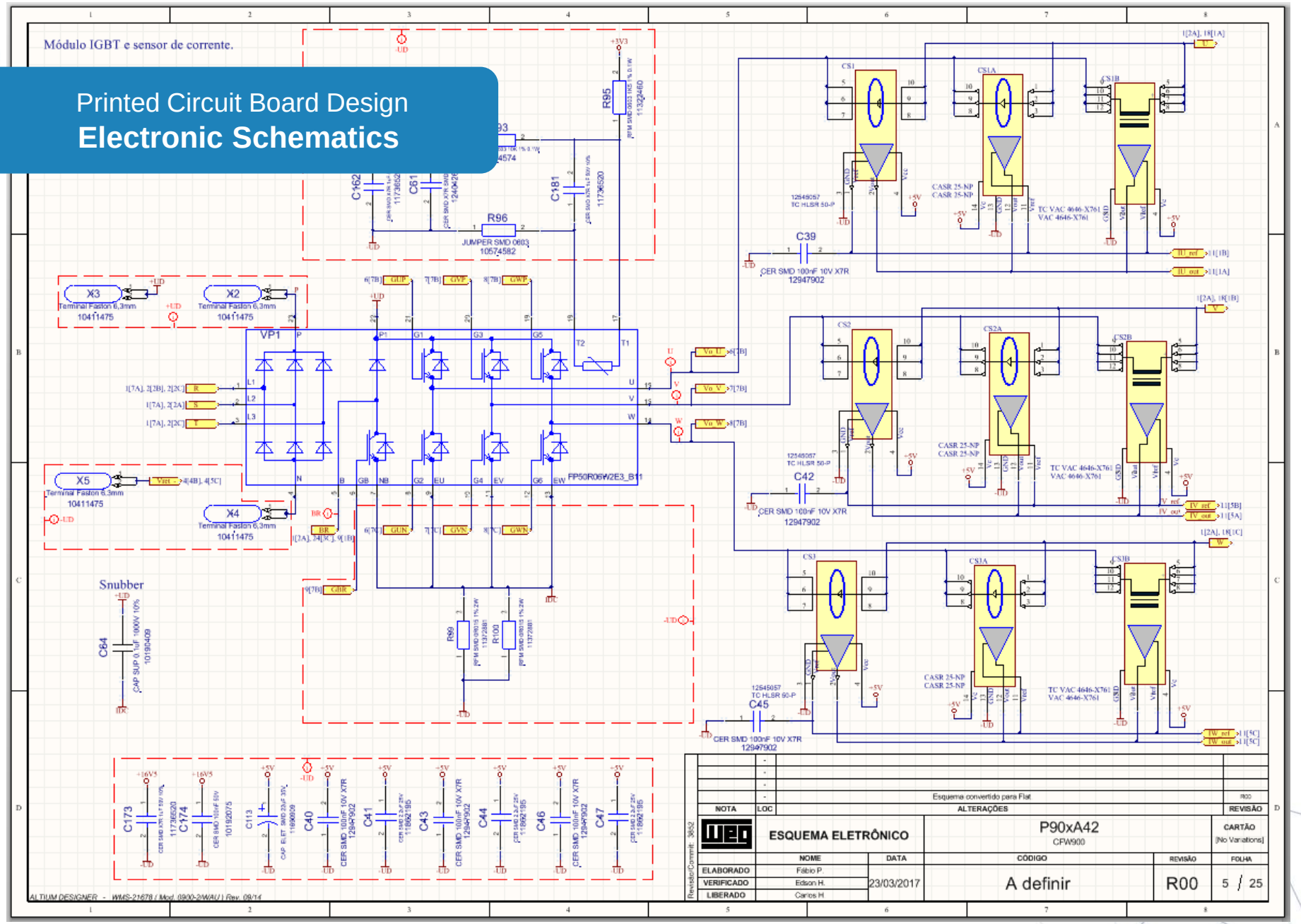
Printed Circuit Board Design

Electronic Schematics



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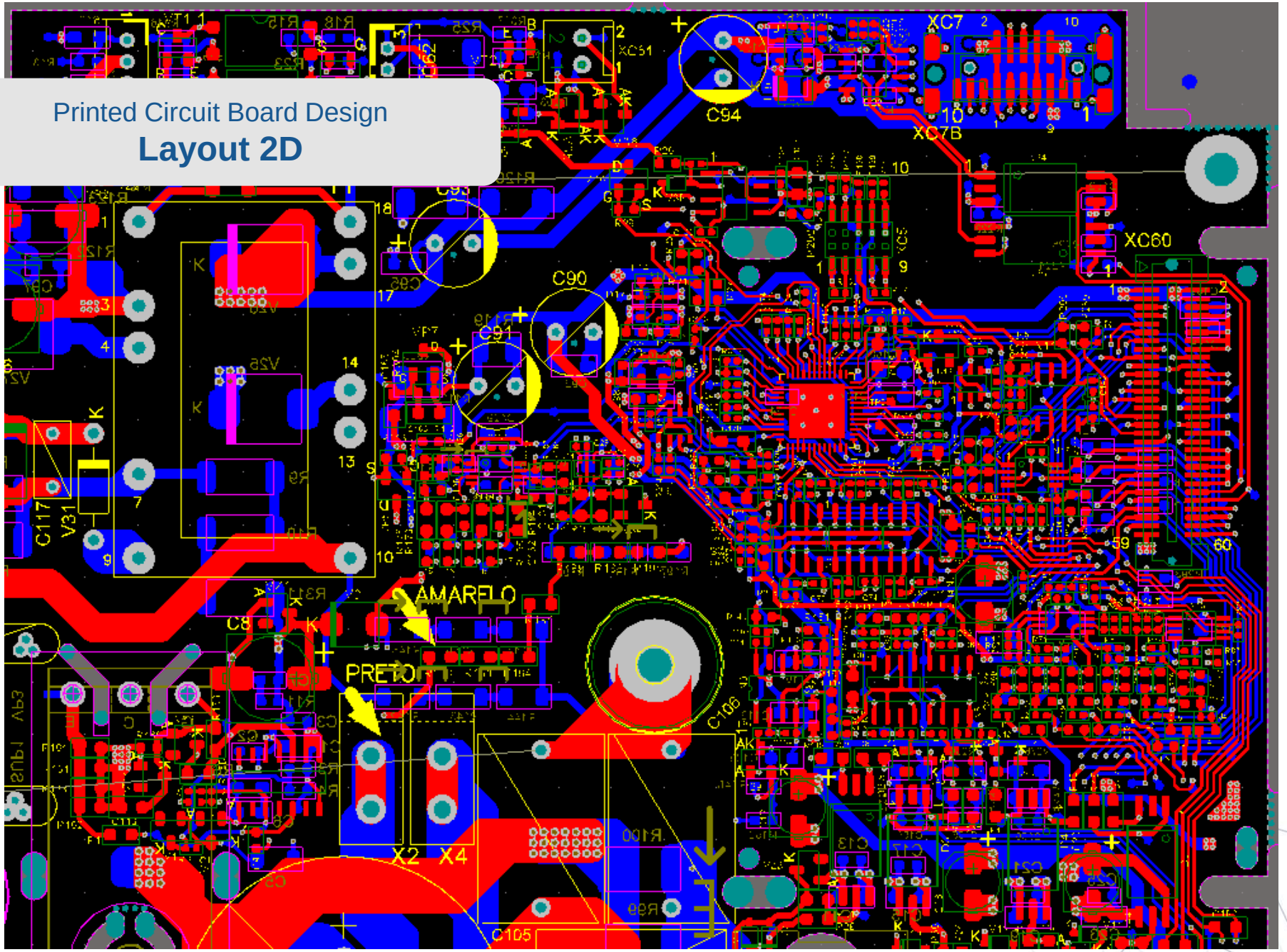
Printed Circuit Board Design

Layout 2D



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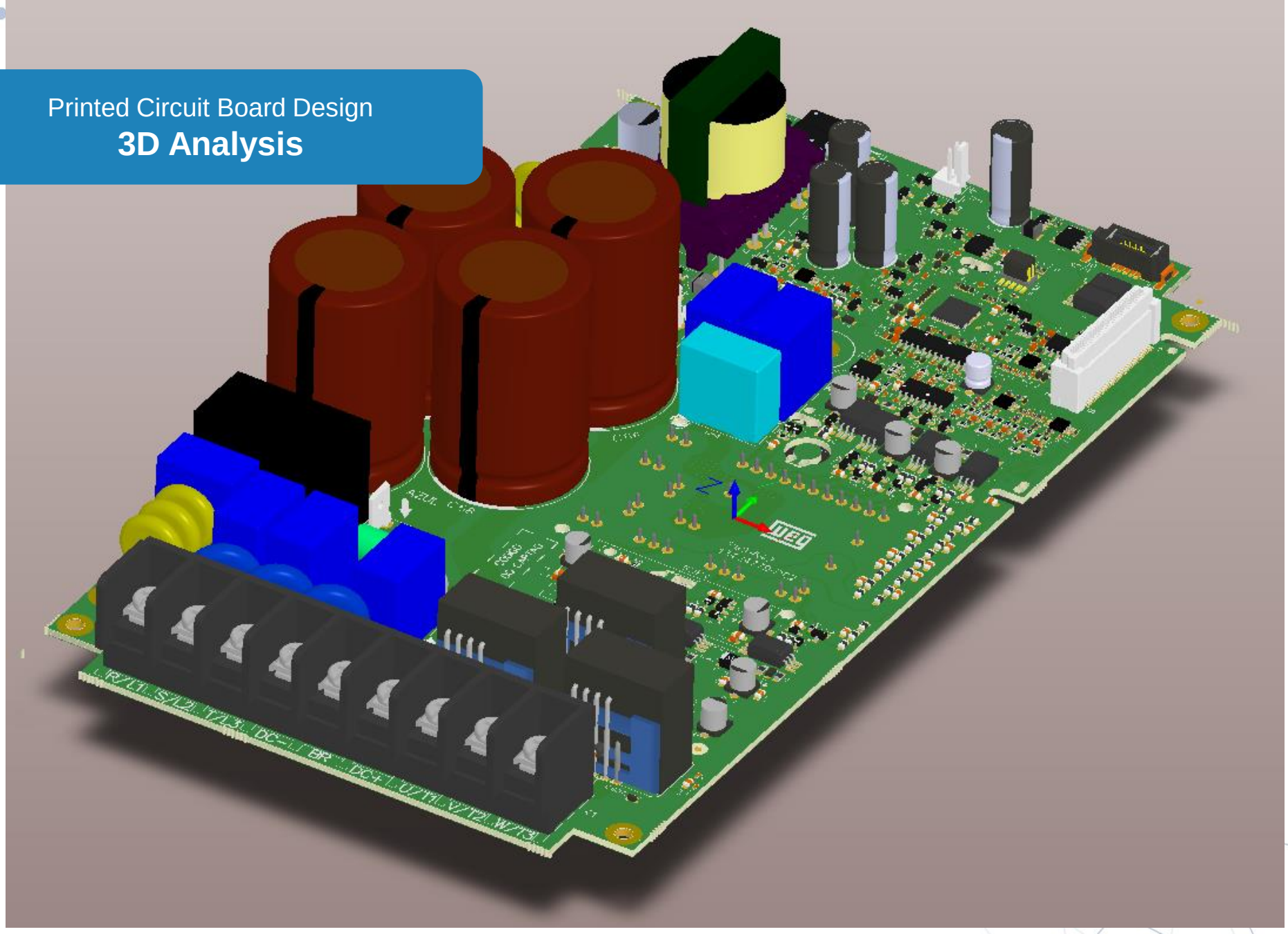
Printed Circuit Board Design

3D Analysis



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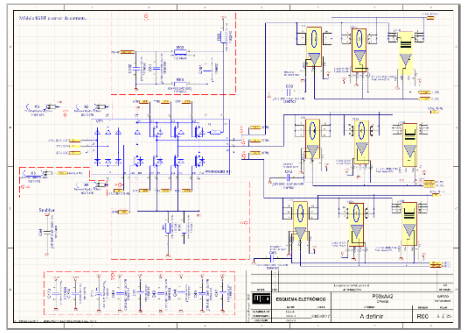
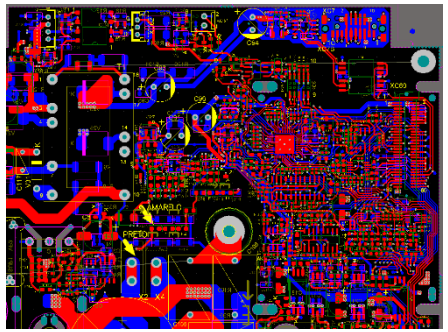
Evolution - Virtual Prototypes

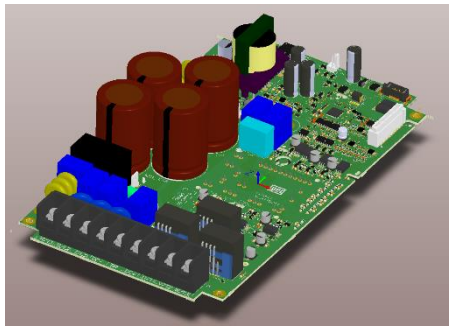
Printed Circuit Board Design



Electronic Schematics



Layout 2D



3D Analysis

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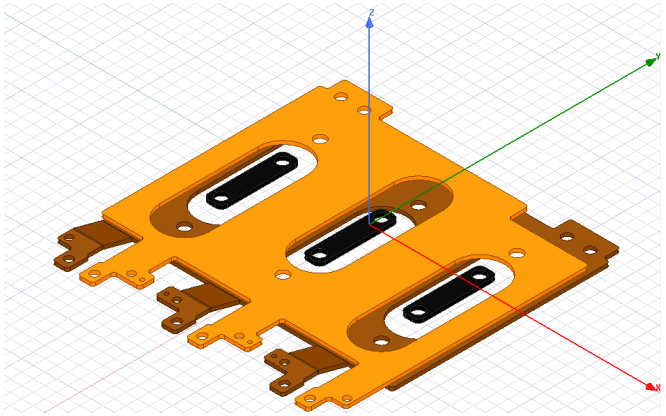
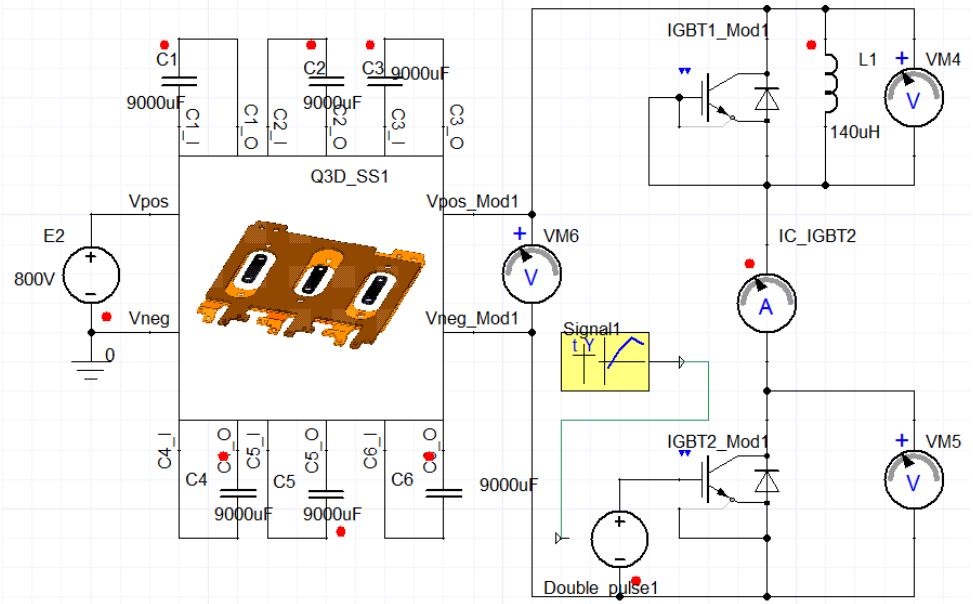
Evolution - Virtual Prototypes

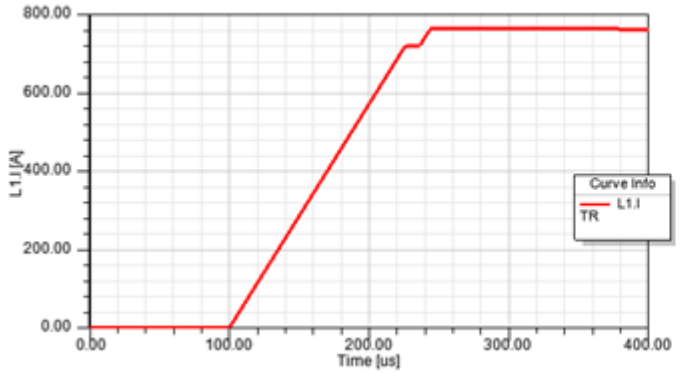
Mechanical bus modeling

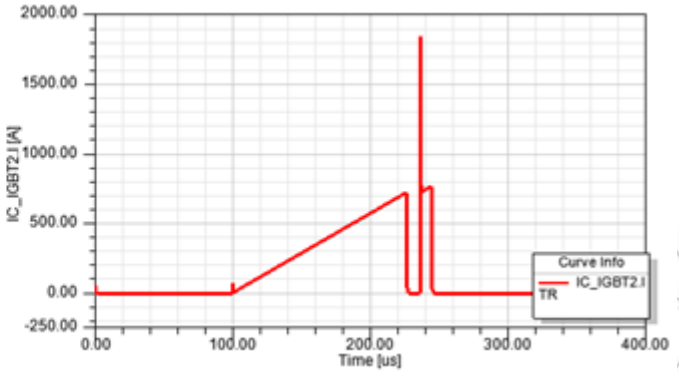


Simulation considering parasitical characteristics of the bus



Simulation results of the double-pulse test





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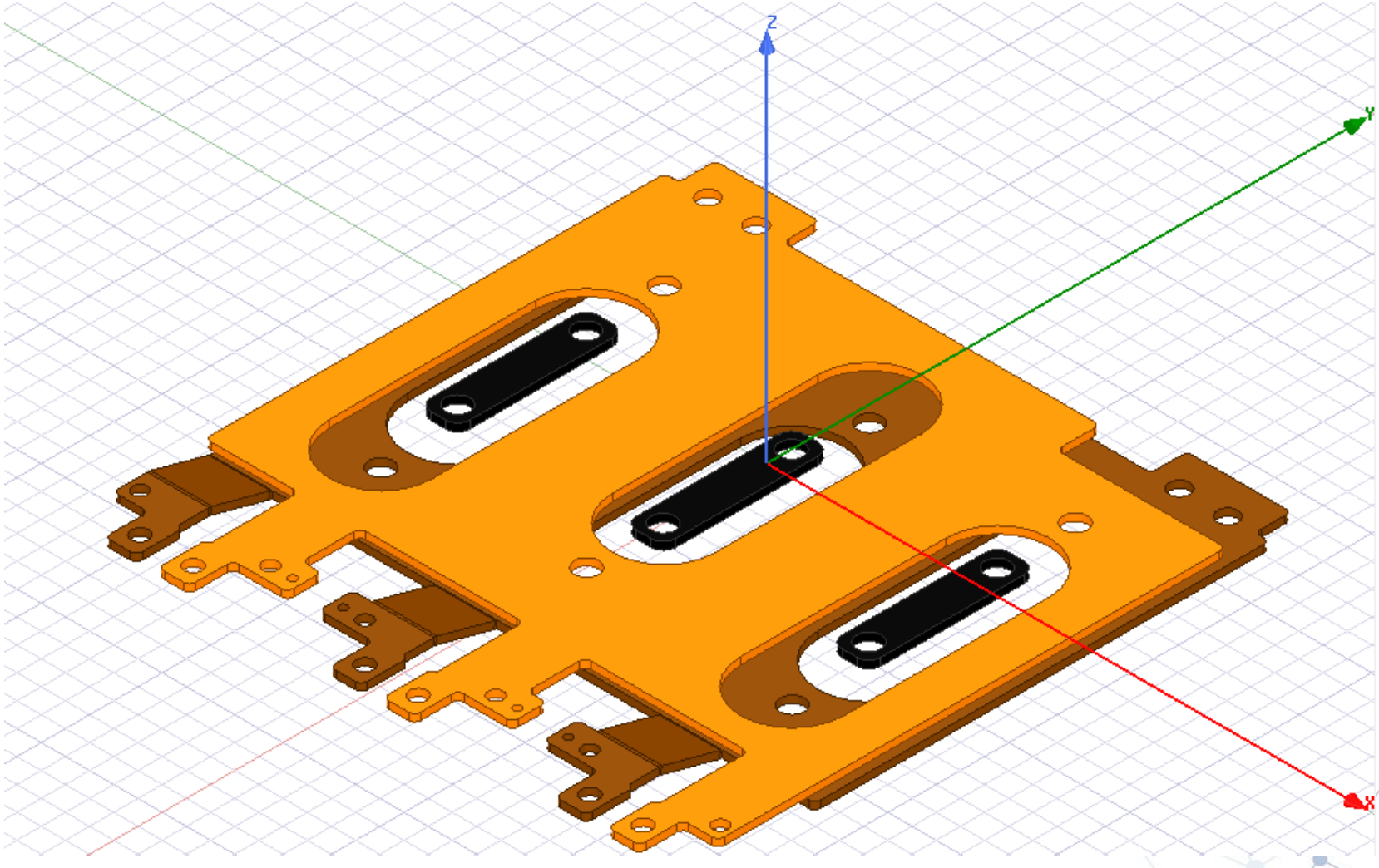
Evolution - Virtual Prototypes

Mechanical bus modeling



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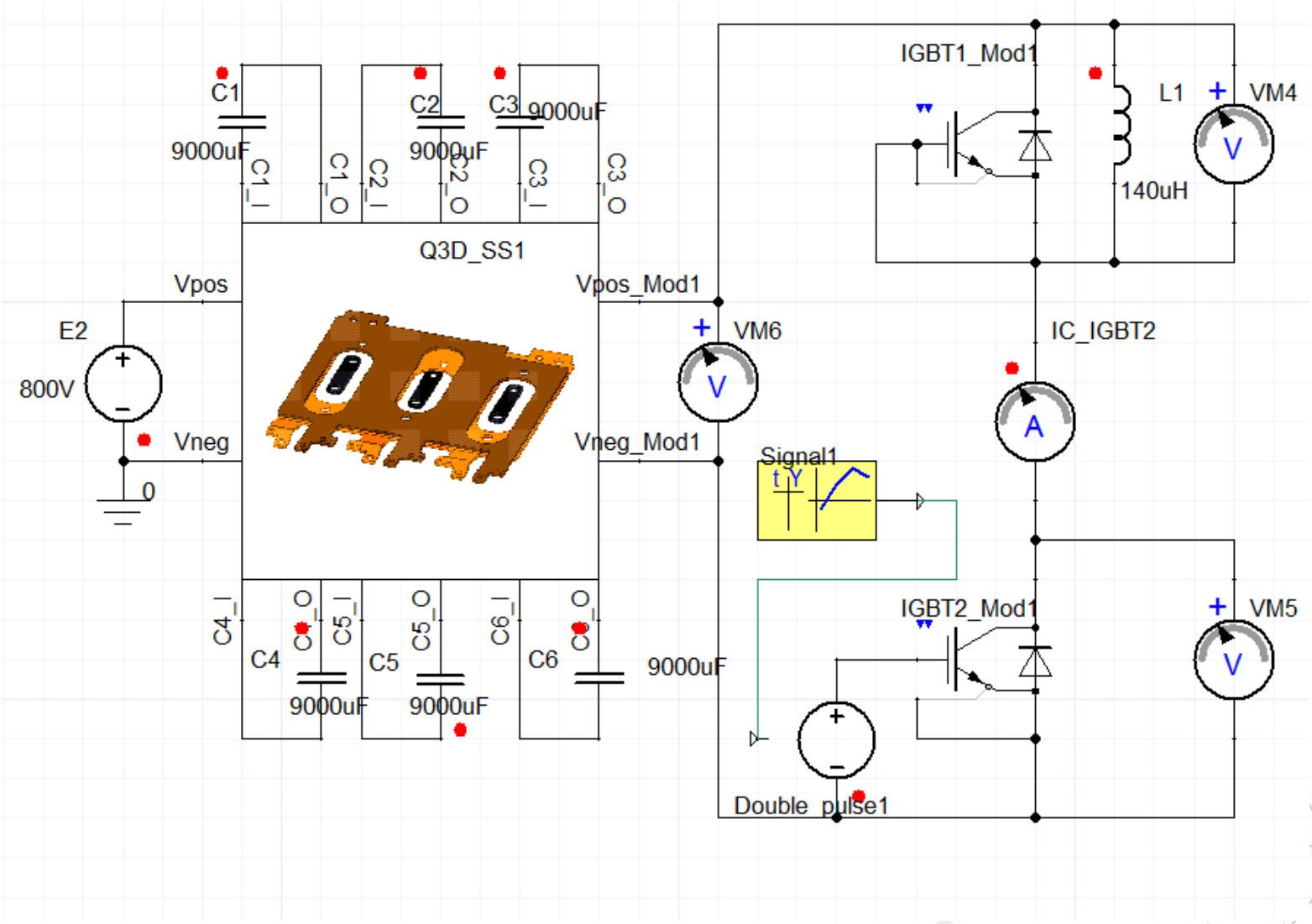
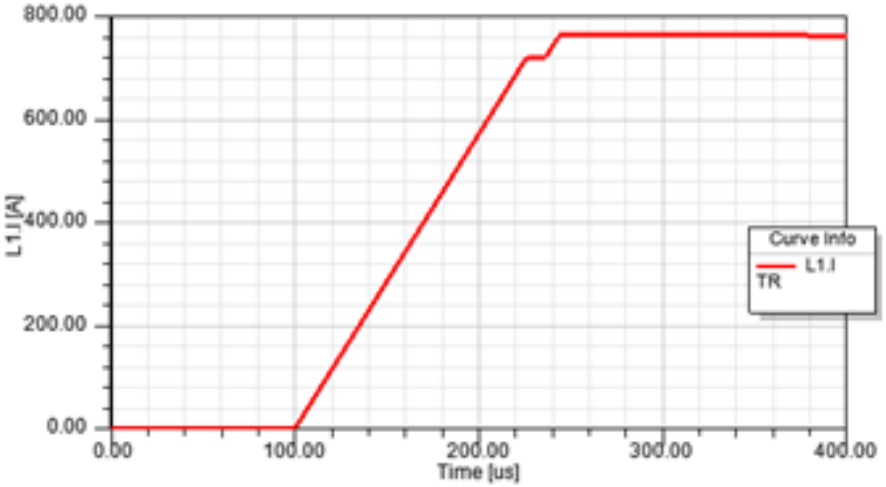
Evolution - Virtual Prototypes

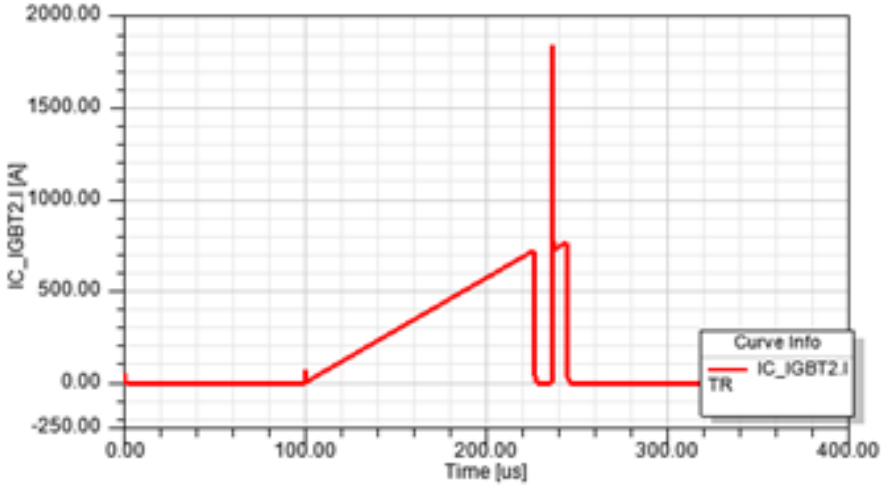
Simulation considering parasitical characteristics of the bus



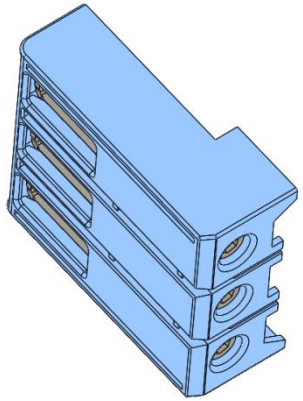
Evolution - Virtual Prototypes

Simulation results of the double-pulse test





Evolution - Rapid Prototypes



Computational
3D model

Additive
manufacturing

Fast prototyping with
3D printing

Testing,
Validation and
Manufacturing of
tools

Final piece

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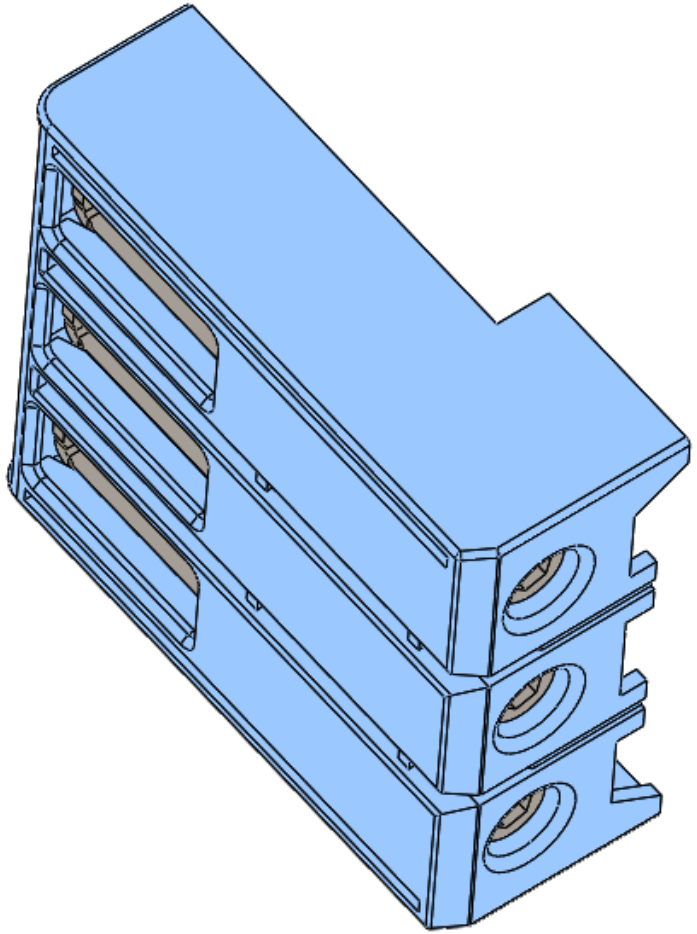
Evolution - Rapid Prototypes

Computational 3D model



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Evolution - Rapid Prototypes

Additive manufacturing - Final Part

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Evolution - Rapid Prototypes

Fast Prototyping with 3D Printing

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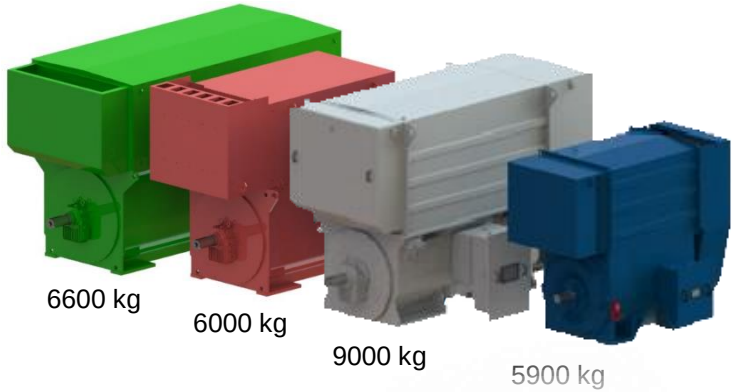
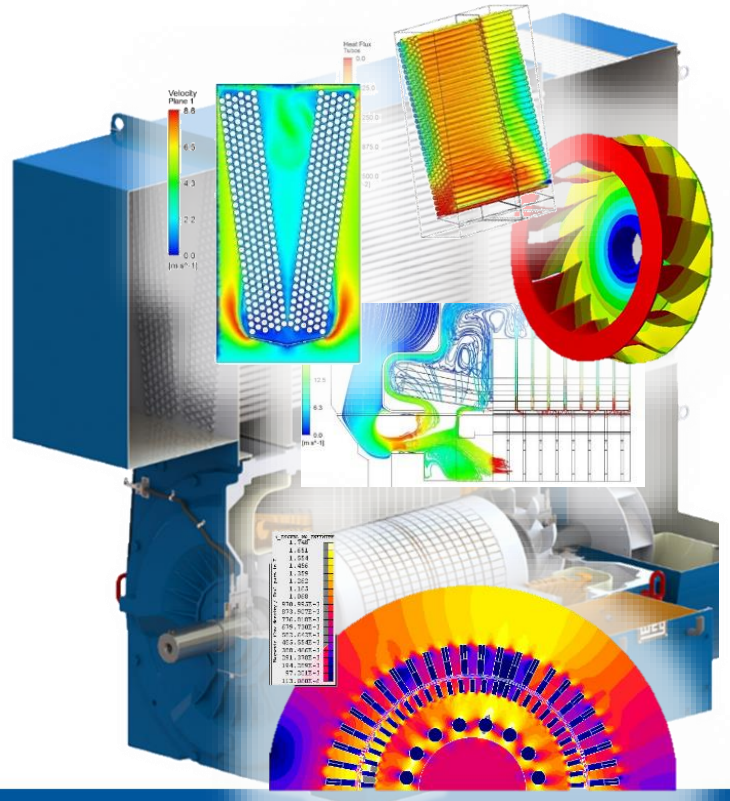
Evolution - Rapid Prototypes

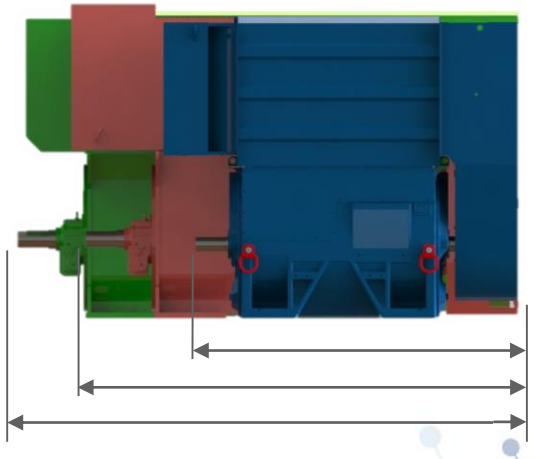
Final piece

Product Evolution - Ex: W60 Line



- Competitor A 500 2P 2000kW 10kV
- Competitor B 500 2P 2000kW 10kV
- WEG MGF 500 2P 1800kW 10kV
- WEG W60 500 2P 2000kW 10kV





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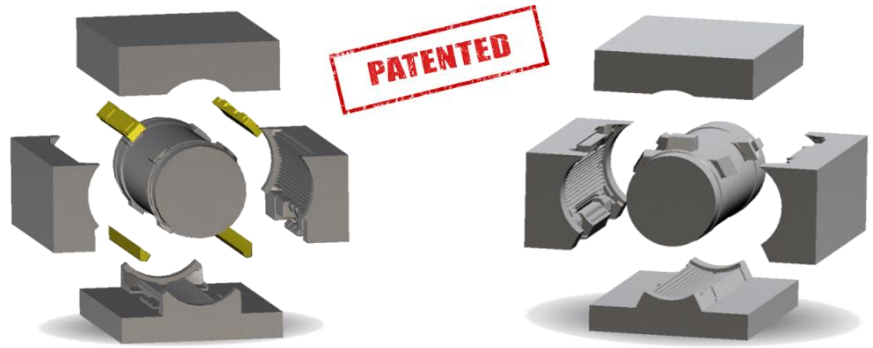
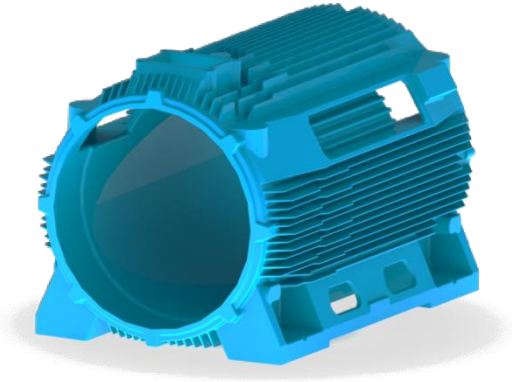
Evolution of the Product and Process - Ex: W50

Product and process development to achieve better results.





Prior technique

Current technique

Innovative product and process

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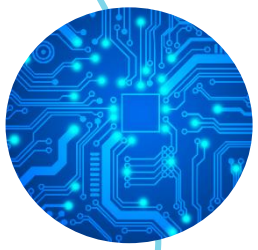
Industry 4.0


Autonomous robots


Simulation


Horizontal and vertical system integration


The Industrial Internet of Things


Cybersecurity


The cloud


Additive manufacturing


Augmented reality


Big data and analytics

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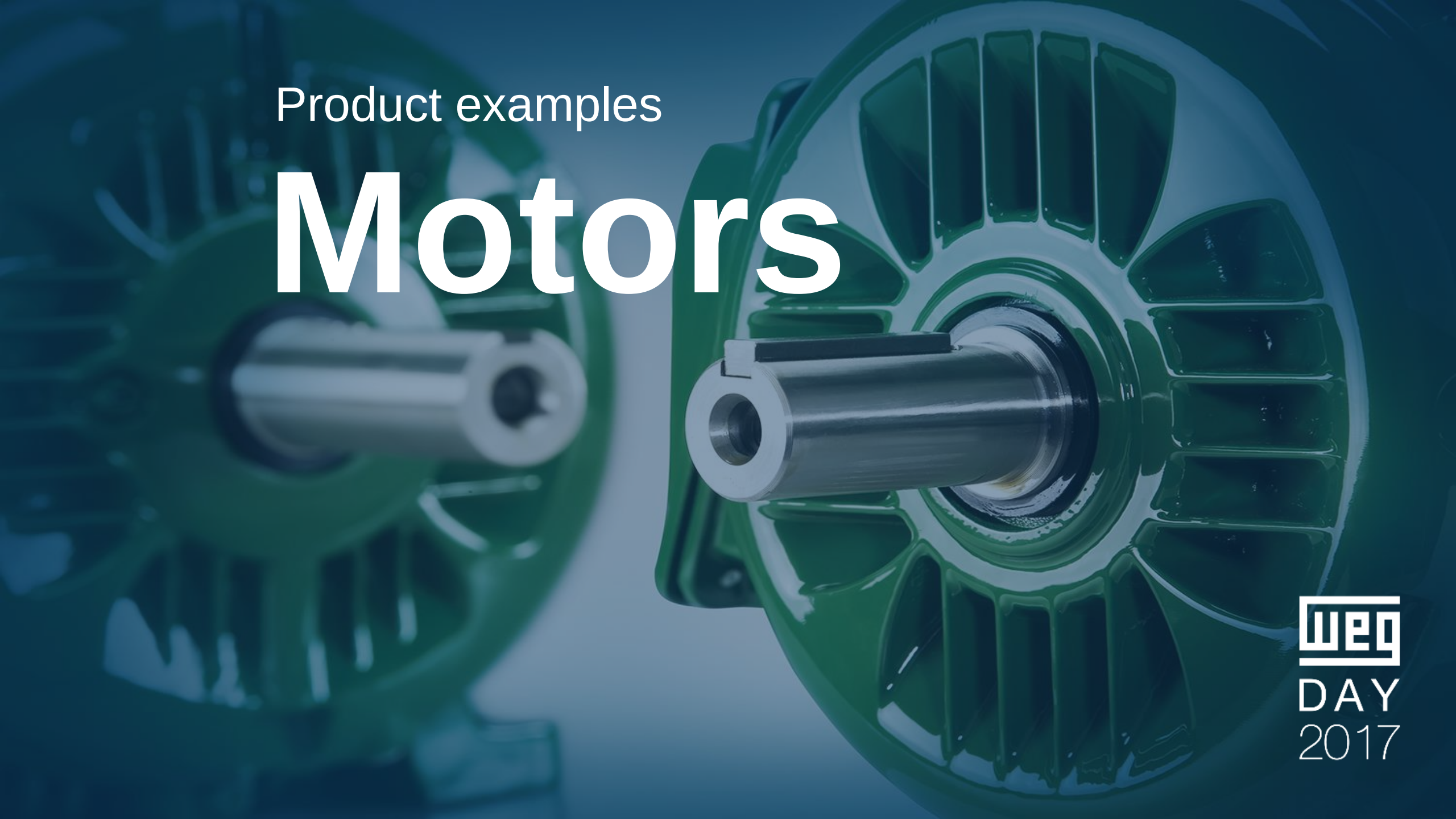
Product examples

Motors



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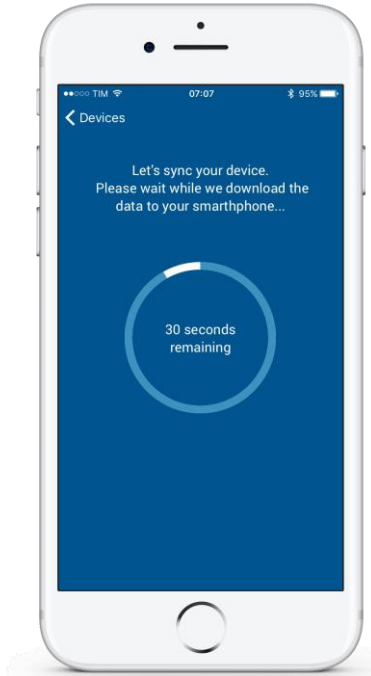
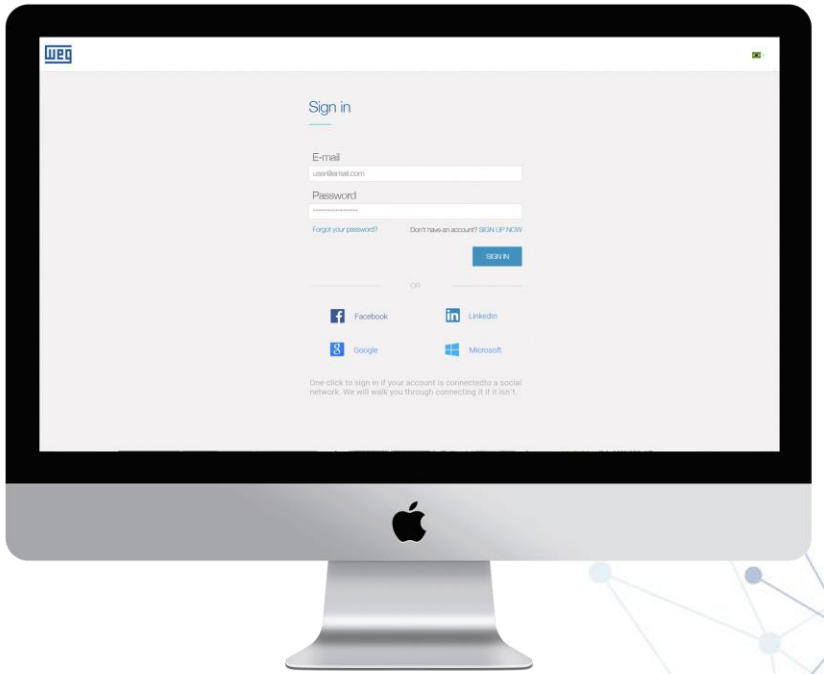
WMS - WEG Monitoring System

Mobile app



WEG IoT cloud



IoT website

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W22 General Purpose Motor Low Voltage

Applications:
Pumps, fans, compressors, mills, crushers, hoists, etc.

PATENTED

29
PATENTS
GRANTED / PENDING

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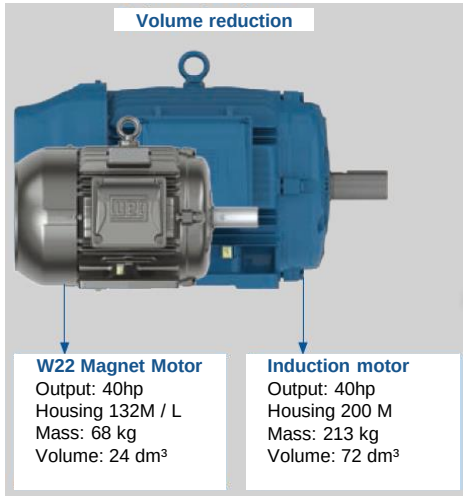
W22 Magnet
Permanent Magnet Motor

Applications that require speed variation, high performance, low noise and / or reduced size.

Higher levels of market efficiency:

- **IE4 Super Premium; e**
- **IE5 Ultra Premium**.



PATENTED

2
PATENTS
GRANTED / PENDING

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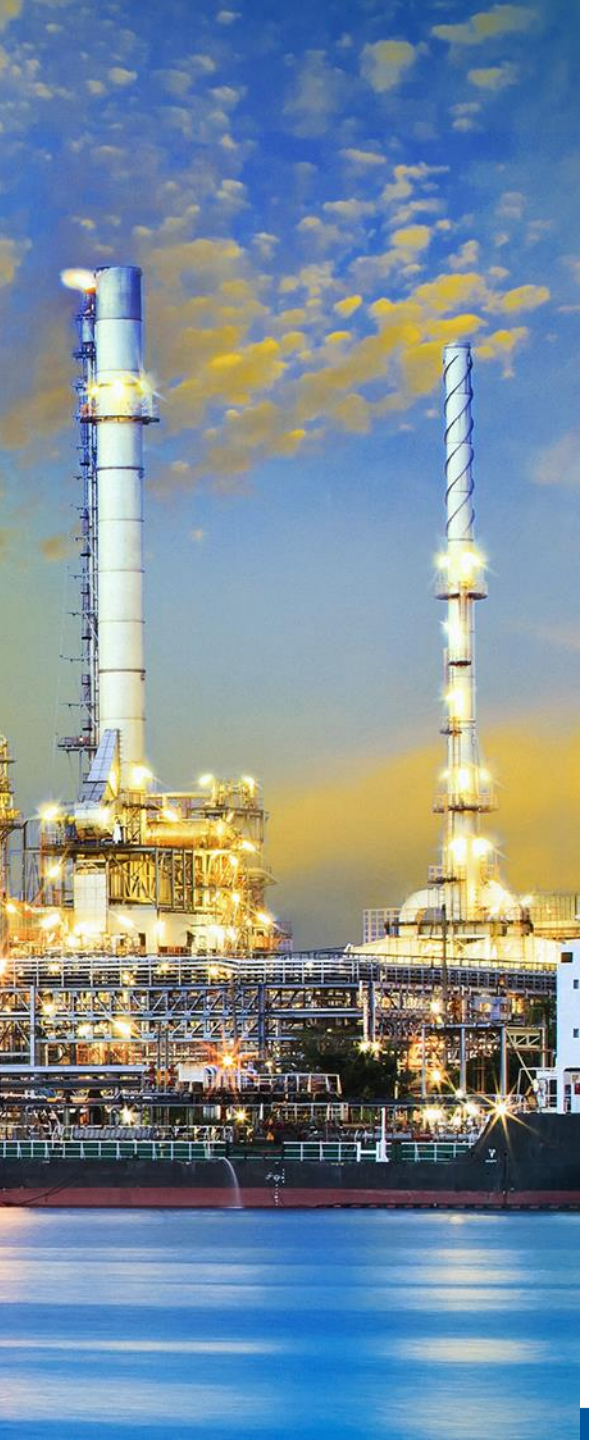
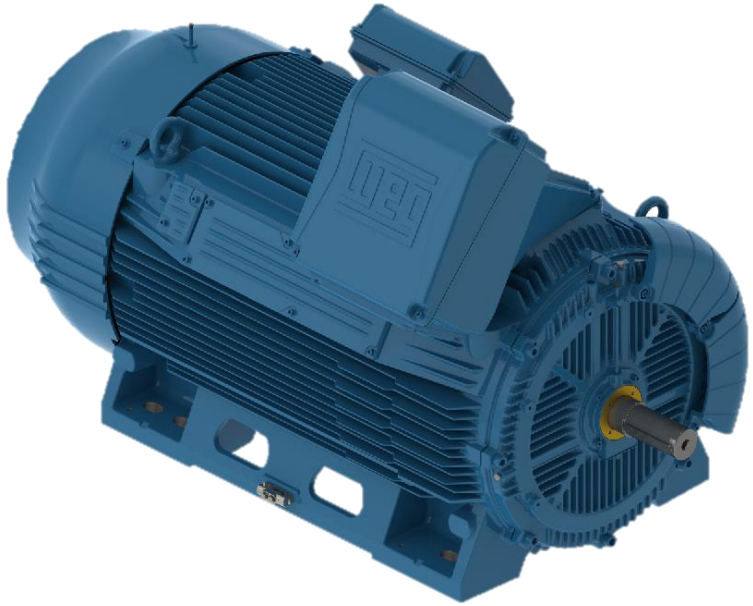


W50 General Purpose Motor High Voltage

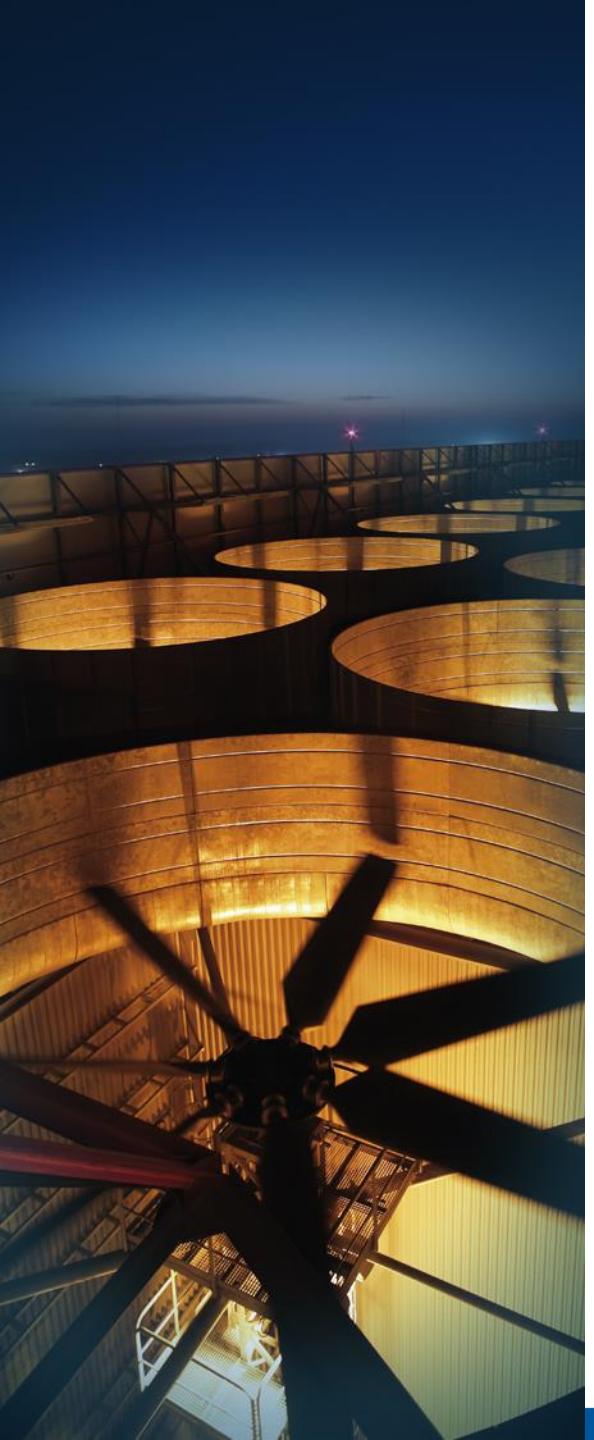
Applications:
Used in many industrial applications that require large and robust motors.

PATENTED



19
PATENTS
GRANTED / PENDING

WEG DAY 2017



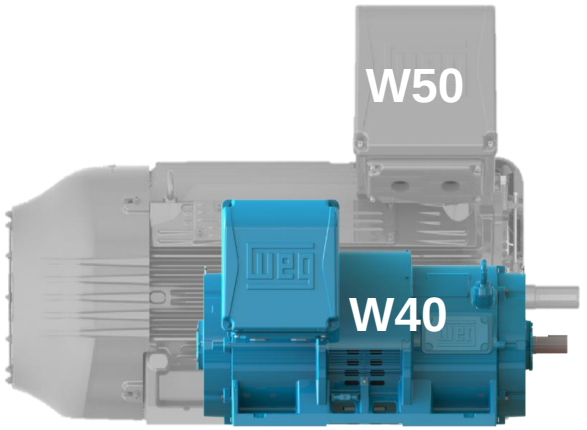
W40 Open Electric Motors

PATENTED

Applications:

Compressors, pumps, fans, etc.

High power, maximum cooling and thermal dissipation in a compact structure.



13
PATENTS
GRANTED /
PENDING

WEG DAY 2017

Water Cooled
Motor

PATENTED

Applications:
Compressors, injection machines, sanitation stations, textile industry and mining equipment.

Compact, silent and high power/size ratio.

1
PATENT
PENDING

WEG DAY 2017

W01 Rolled Steel
Motors

Main Applications:
Compressors, food industry, ventilation systems, pumps, etc.

- New ventilation system
- Low noise level
- Low weight
- Robust

4
PATENTS
GRANTED / PENDING

WEG DAY 2017

Washing Machines
Motors

PATENTED

semi automatic
washing machines

Automatic
washing machines

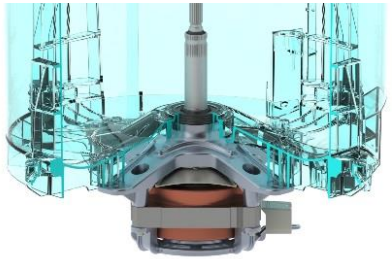
CIM 4P

Universal

Midway
direct drive

Plug & Play, Less noise,

Higher efficiency and reliability



100
PATENTS
GRANTED /
PENDING

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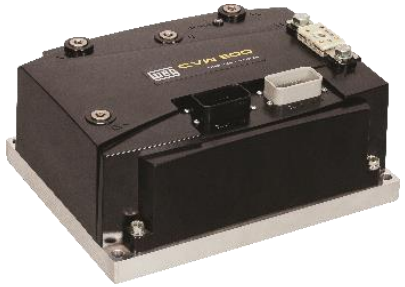
Powertrain (motor + drive)
For Electric Vehicles

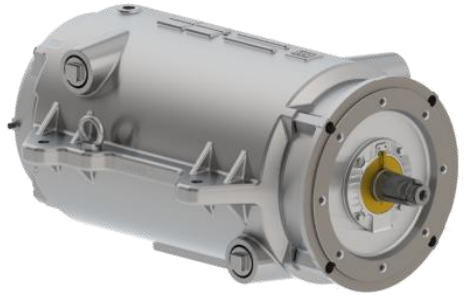
PATENTED



Light vehicles

Golf trolleys, industrial truck tug, electric forklifts and similar vehicles

1
PATENT
PENDING

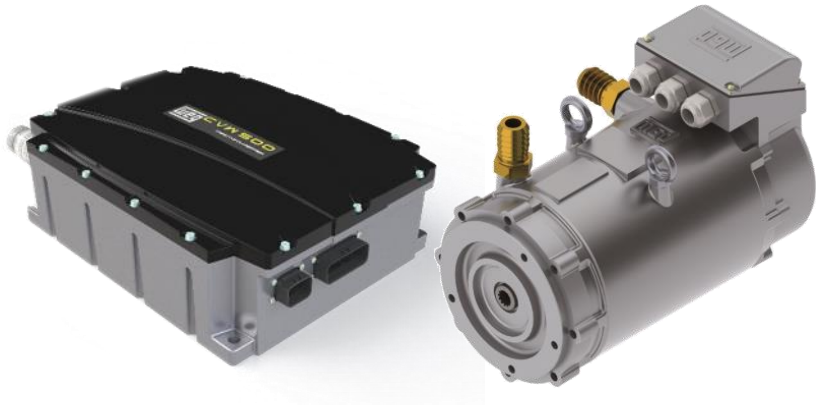


Heavy vehicles

Buses, trucks

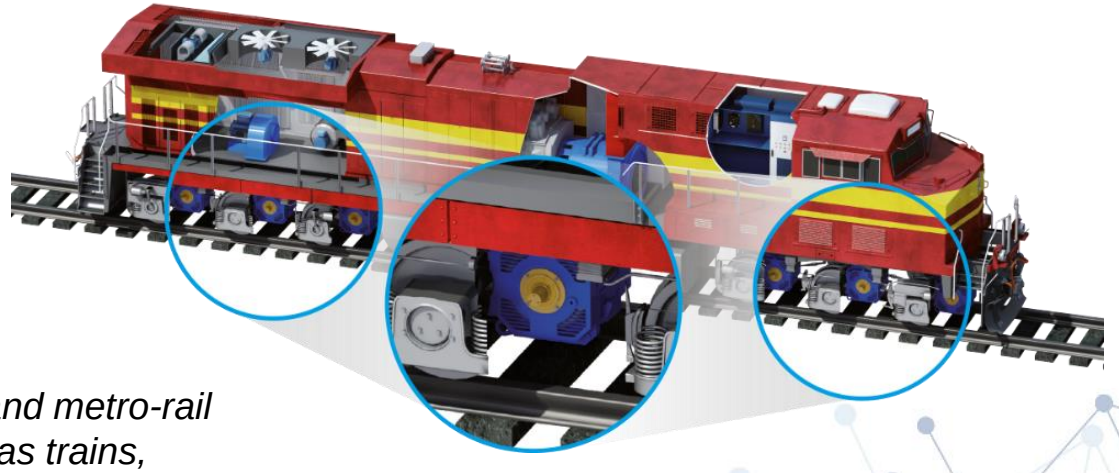
WEG DAY 2017

Powertrain (motor + drive)
For Electric Vehicles



Utility vehicles

Delivery trucks, minibuses and vans



Locomotives

Locomotives and metro-rail vehicles such as trains, monorails, VLTs and trams

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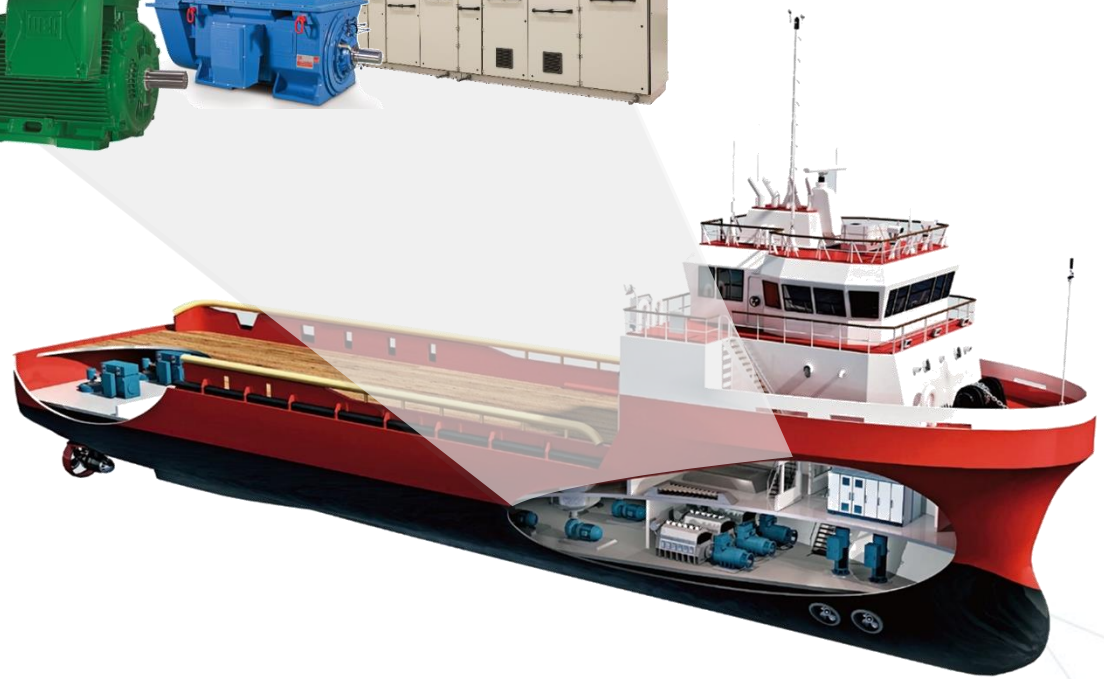
Complete Solution
for Naval Propulsion

Electric Motors, Electric Panels, Inverters and Soft-starters, Control Systems, Dry Transformers and Coatings



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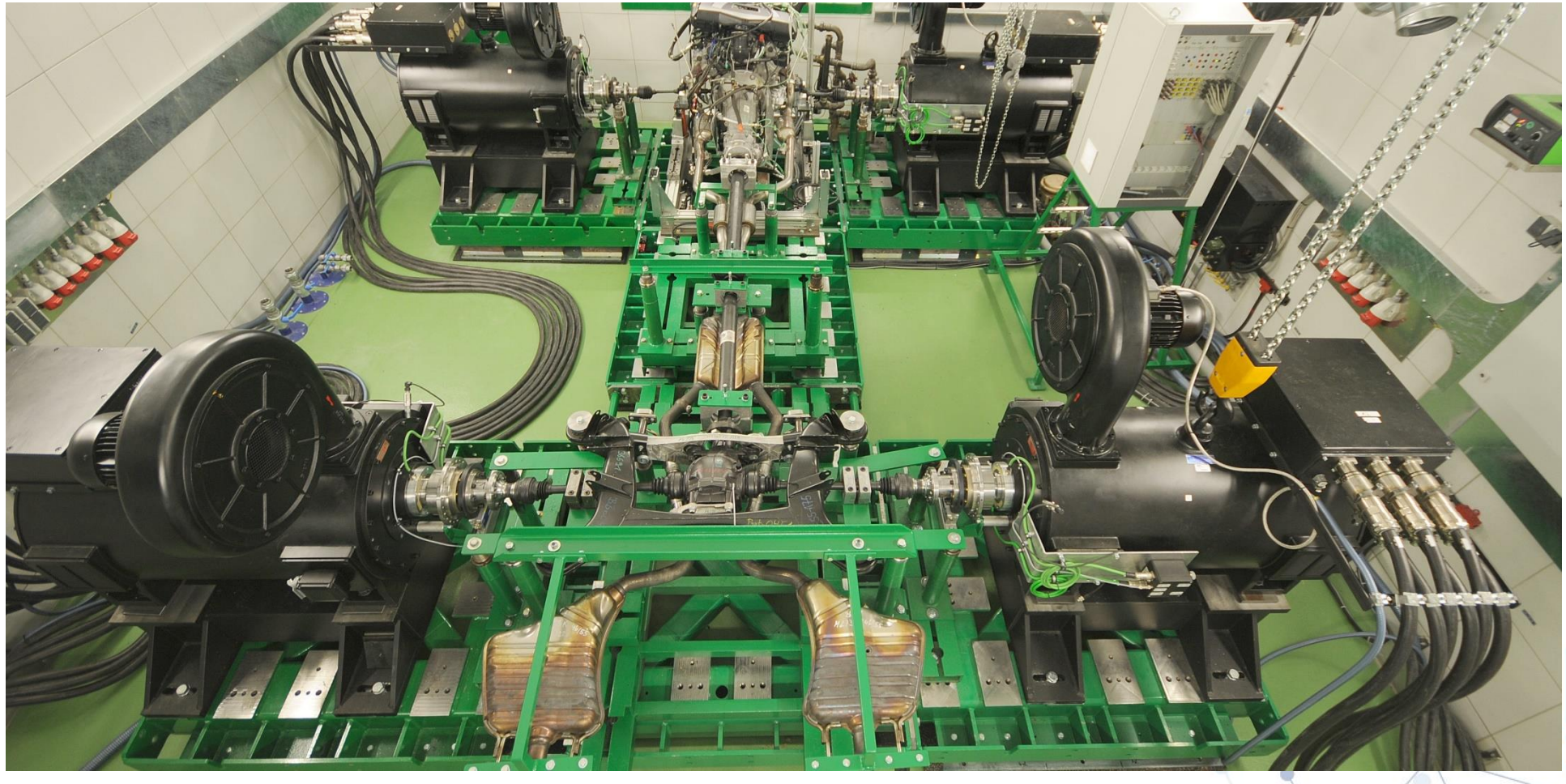
High Speed Motors

PowerTrain Test Bench (4X4))



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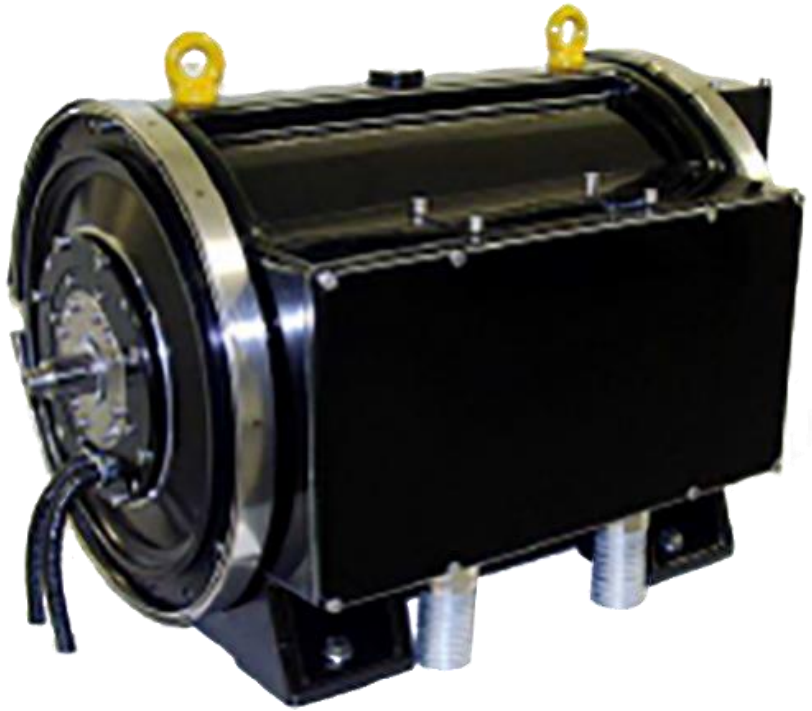
High Speed Motors



Magnetic bearings and respective control.

Application:
Compressors, Turbomolecular Pumps, etc.

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Hermetic Motors

Main application:
Compressor

PATENTED

600HP - 4P

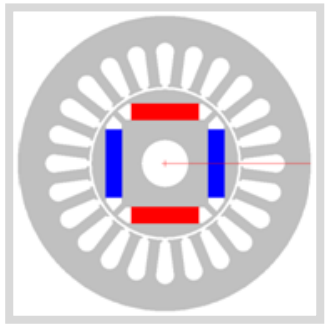
1
PATENT
PENDING

WEG DAY 2017

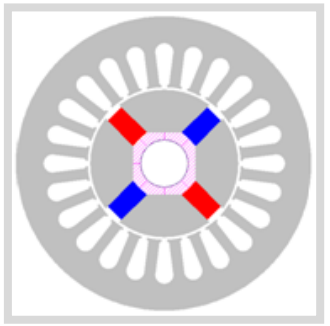
Motor with Magnets inside the Rotor

Features:

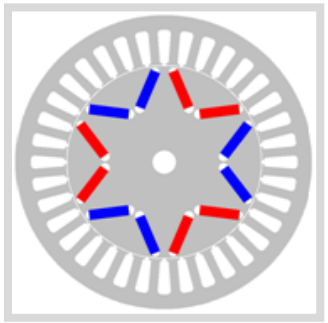
- BLAC or BLDC motors
- Most are distributed windings
- Rare earth or ferrite magnets
- Higher field weakening capacity
- Higher Leakage Flux
- Reluctance Torque
- More difficult to manufacture the rotor



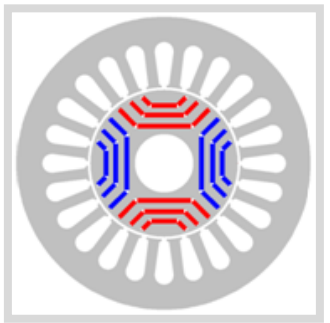
Tangential Magnets



Radial magnets



V-Magnets



Multi-Layer Magnets

WEG DAY 2017

Axial Flow PM Motors for Electric Vehicles

Under development

Output
80kW

- High Energy Permanent Magnets
- High power density [W/kg]
- High torque density [Nm/kg]
- Input voltage of the drive: 440 V
- Rated Torque: 212Nm
- Base rotation: 3600rpm
- Water cooled

WEG DAY 2017

EC motor (Electronically commutated motor)

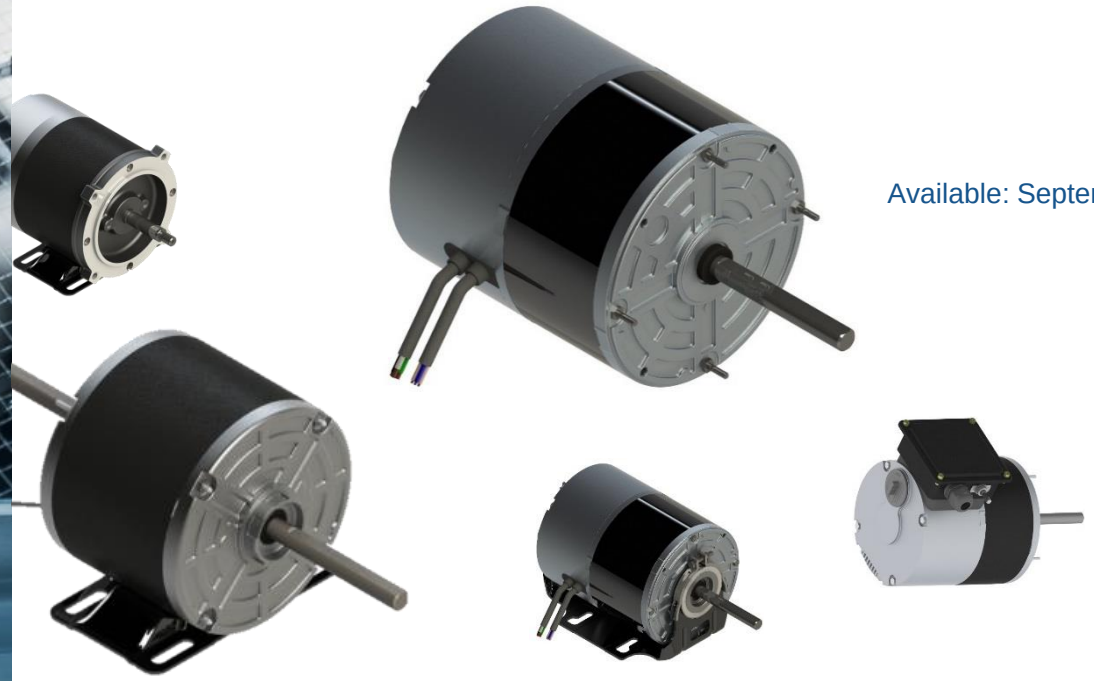
Applications:

Commercial and Residential Ventilation Systems for HVAC

Permanent magnet motor with built-in electronic control

Power from 1/6 to 1 1 / 2hp

NEMA 48 (IEC80 equivalent)



Available: September 2017

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Product examples

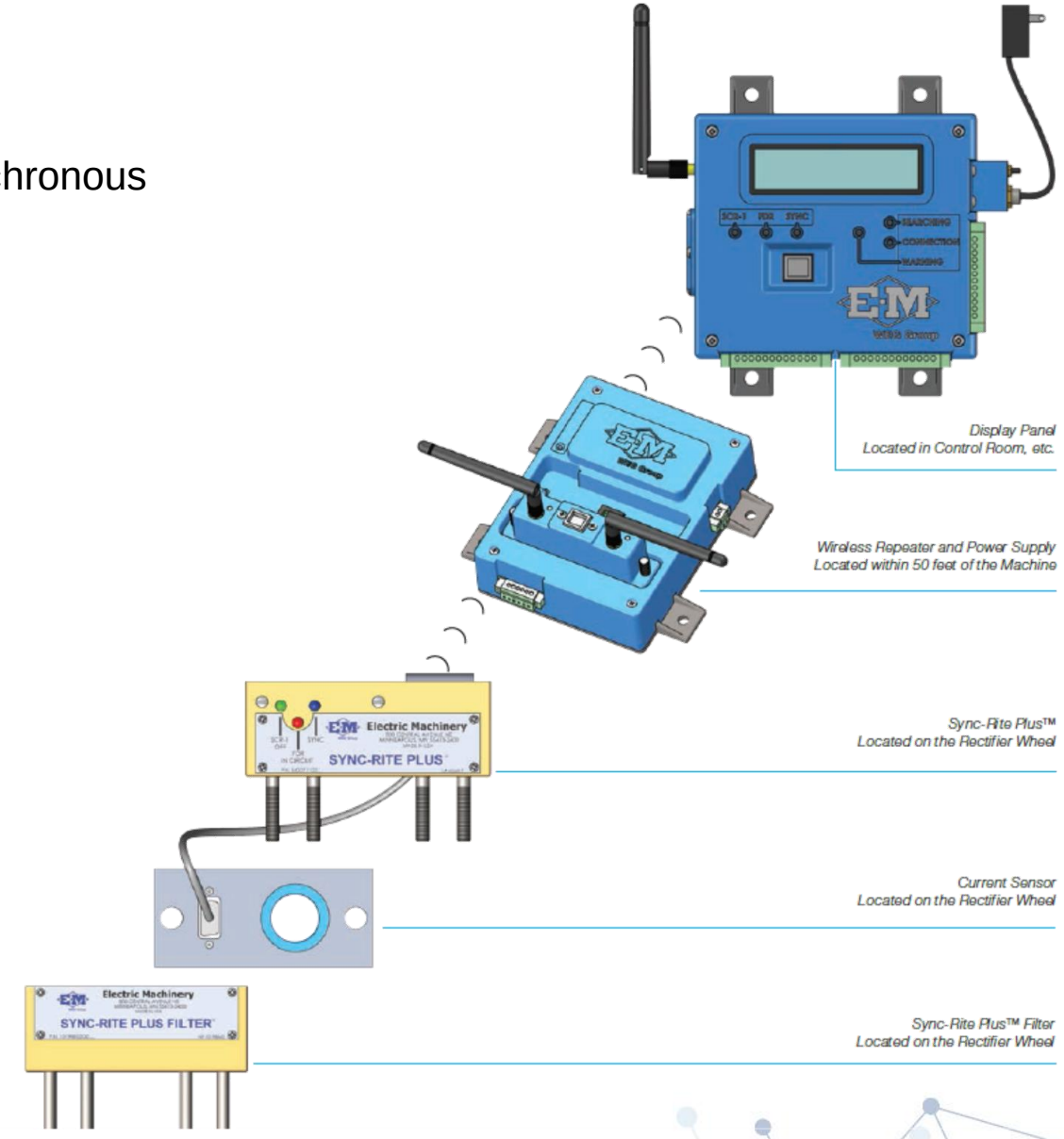
Energy

WEG DAY 2017

Sync-Rite™ Plus

Synchronous Control Module for Synchronous Brushless Motors

- Data transmitted via Bluetooth to an external display or laptop
- External display monitors data from field winding and estimates temperature, timing status and generates alarms for users
- WEM Sync-Graph software shows the waveform, rotor telemetry and measured data from the starting
- The data monitored on critical machines allow rapid analysis of rotor conditions and help in rapid field diagnosis



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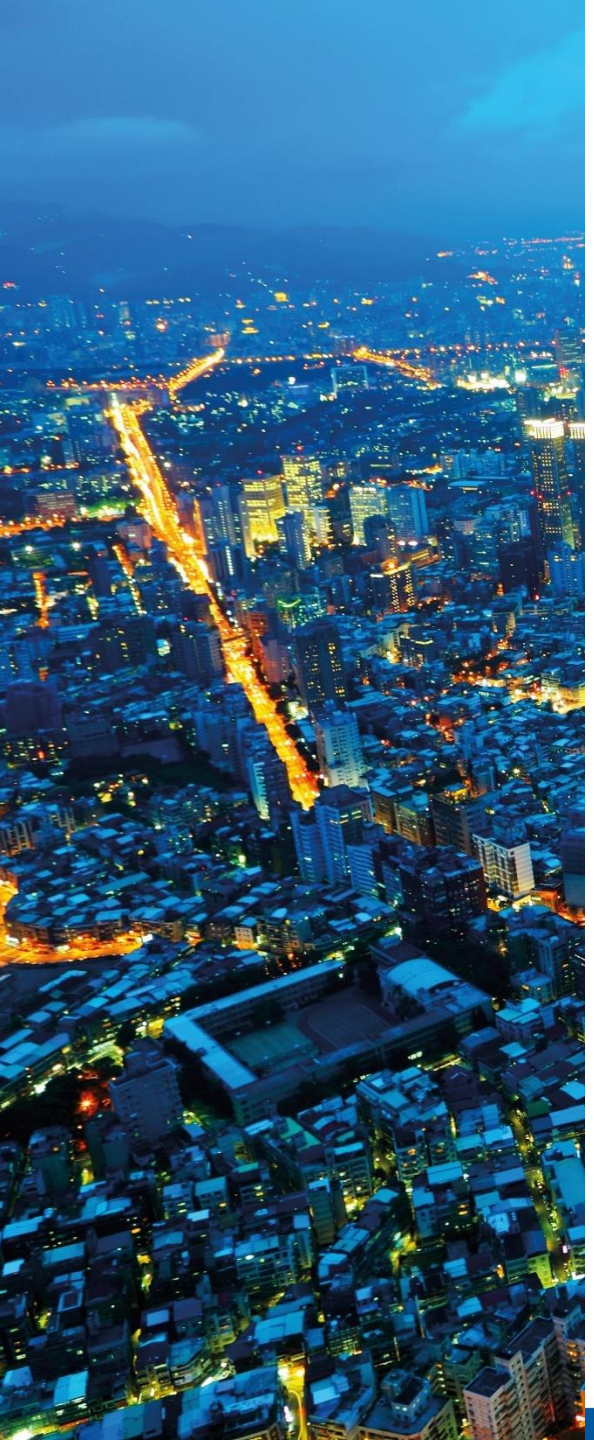
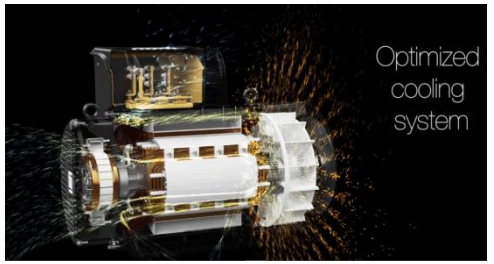
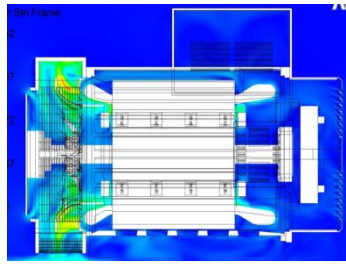


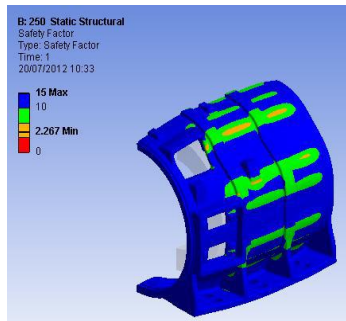
AG10 Alternator Line Optimization

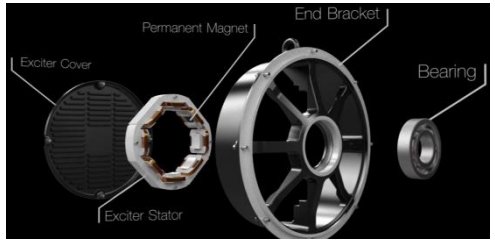
- Frames: 250 to 315
- Voltage: up to 600V
- Speed: 4 poles
- Cooling: IC01
- Application:
- Diesel Engines

Available:
4Q / 2017









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Induction Motors
W60

PATENTED

Applications:
Compressors, pumps, fans, etc.

Modular, compact, modern and efficient, reliable and compatible with frequency inverters.

2
PATENTS
GRANTED / PENDING

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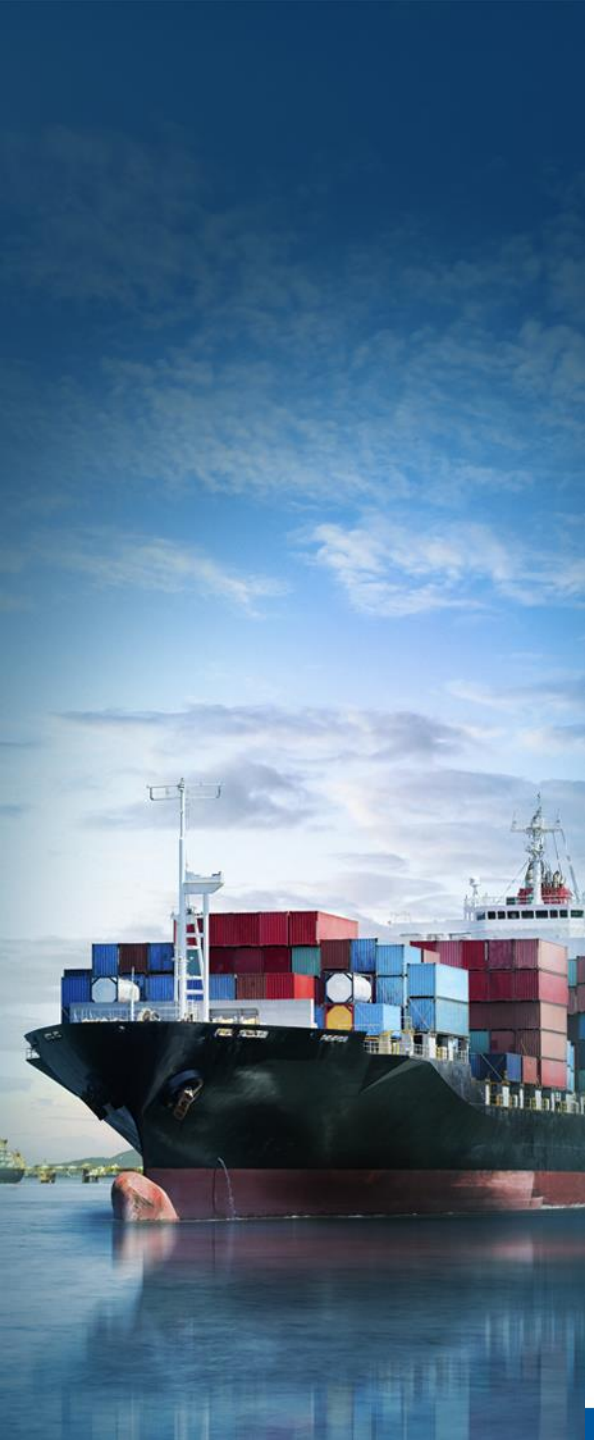
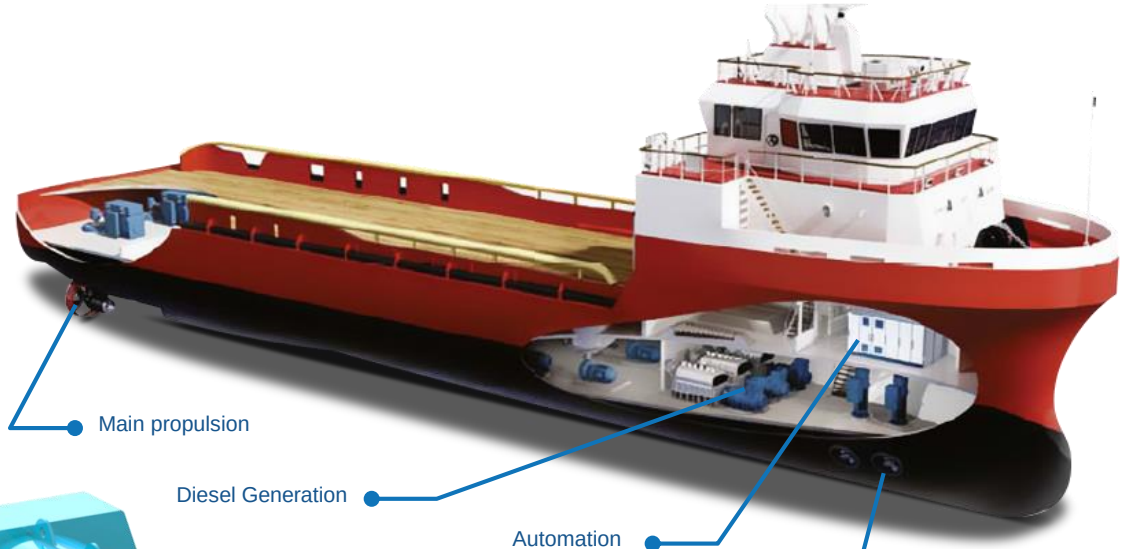


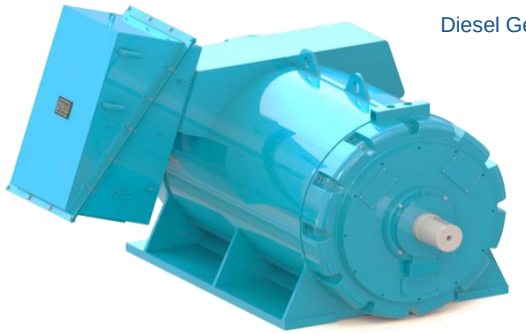
WGM20 Water cooled Induction Motors

Power: 300 to 3000 kW
Voltage: 400 to 4160 V
Speed: 2 to 8 poles
Cooling: IC71W

Technical advantages:
Compact
Optimized noise levels
High torque-to-speed ratio

Application:
Naval propulsion
Dredging



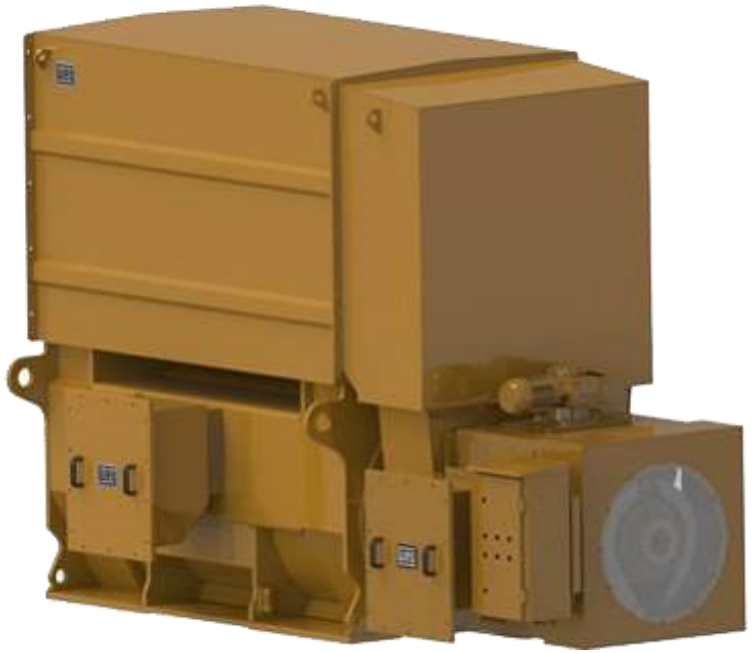


WEG DAY 2017

Induction Motors
Mining

Two brush holder systems:
Fixed
Liftable

PATENTED



1
PATENT
PENDING

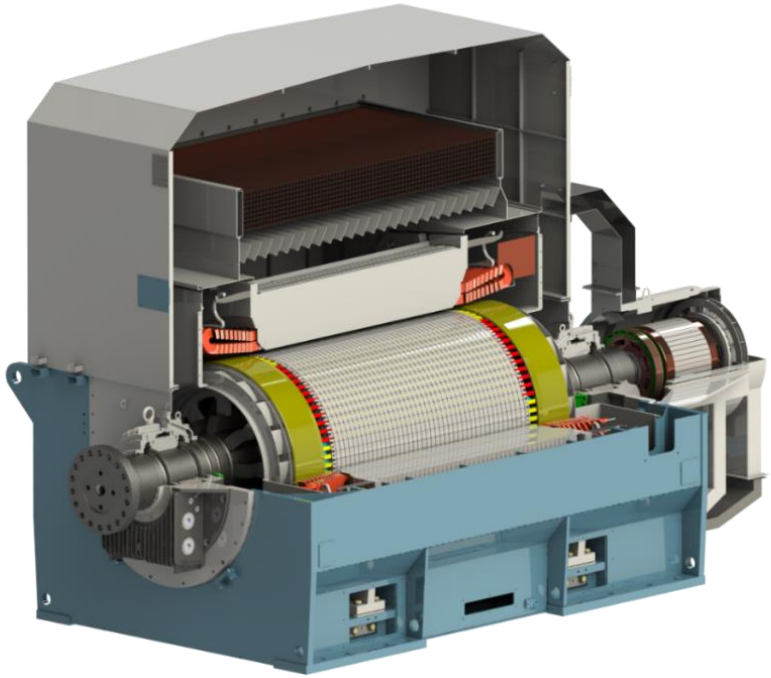
WEG DAY 2017

New 4P Turbogeneration Platform

Power: up to 62.5 MVA
Voltage: Up to 15 kV
Speed: 4 poles
Cooling: IC81W
Available: 4Q / 2017

Technical advantages:
Non salient poles
Compact
Brushless Exciter

Application:
Steam turbines
Gas Turbines



1
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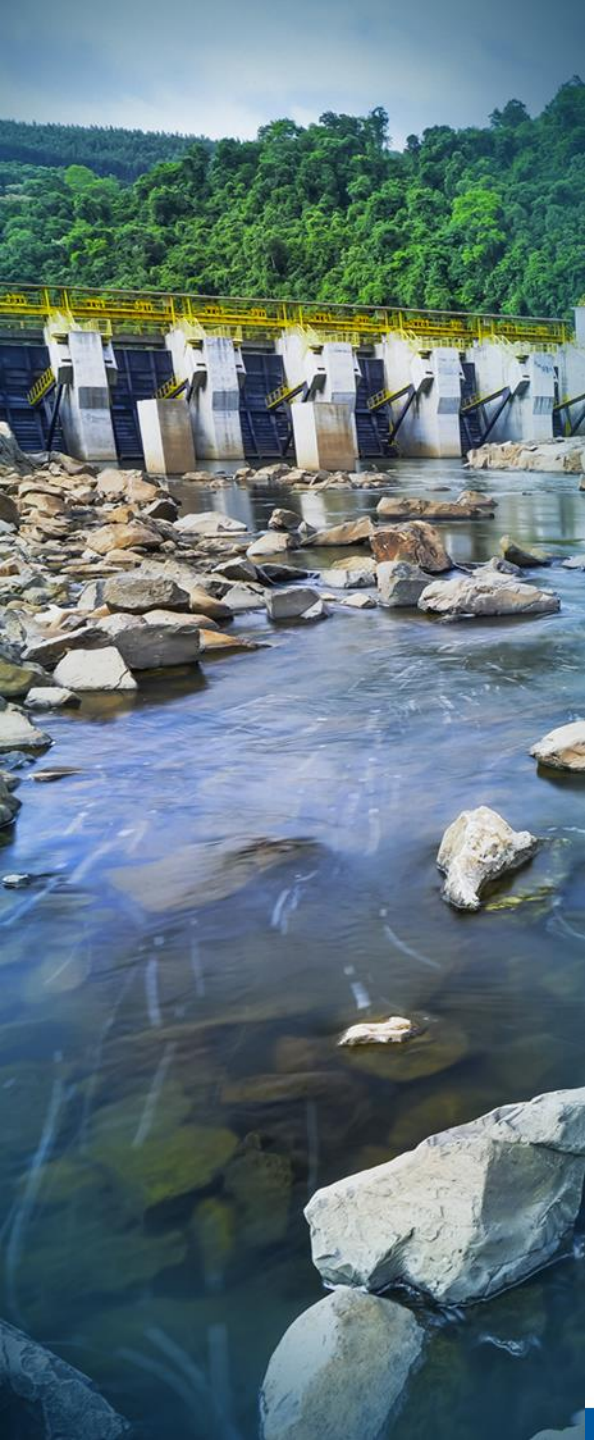
PENDING

PATENTED

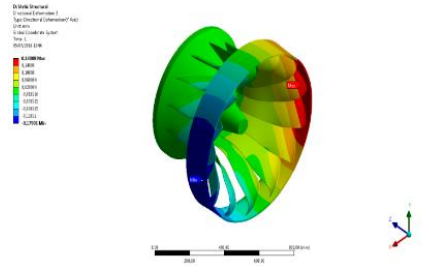
WEG DAY 2017

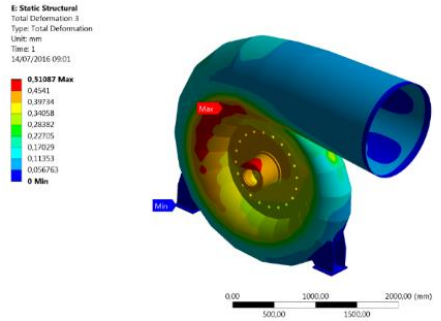


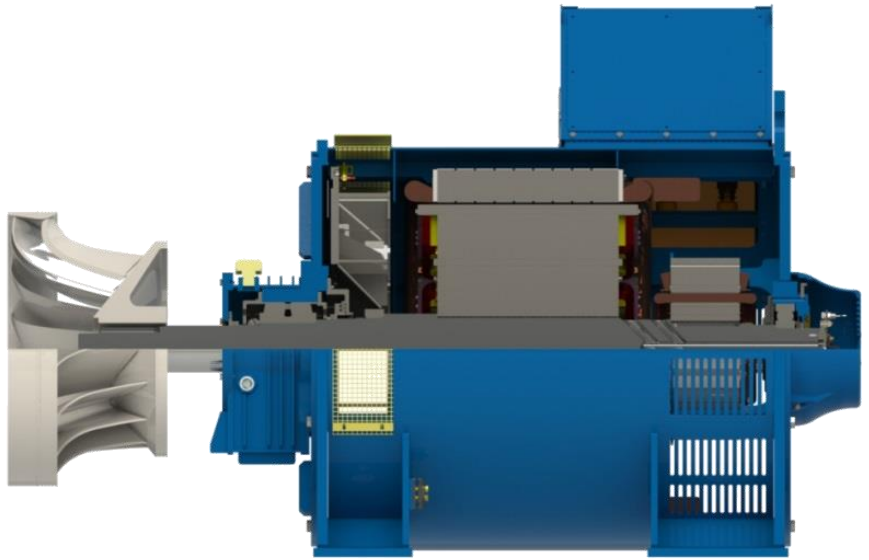
HGP Hydroelectric Generator

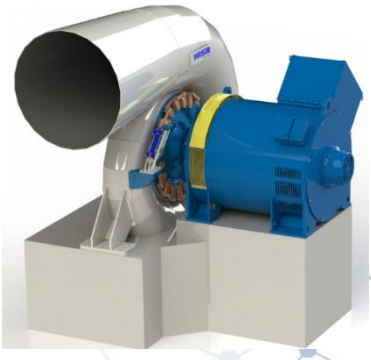
Application: Hydroelectric Generating Plant (HGP)

Power: 300kVA to 3700 kVA
Voltage: 480 to 4160 V
Speed: 6 to 16 poles
Construction: Horizontal
Power factor: 0.9
Available: 4Q / 2017









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Wind turbines

Features:
2.1 and 3.3 MW
Direct coupling
Synchronous generator with permanent magnets
Full power converter

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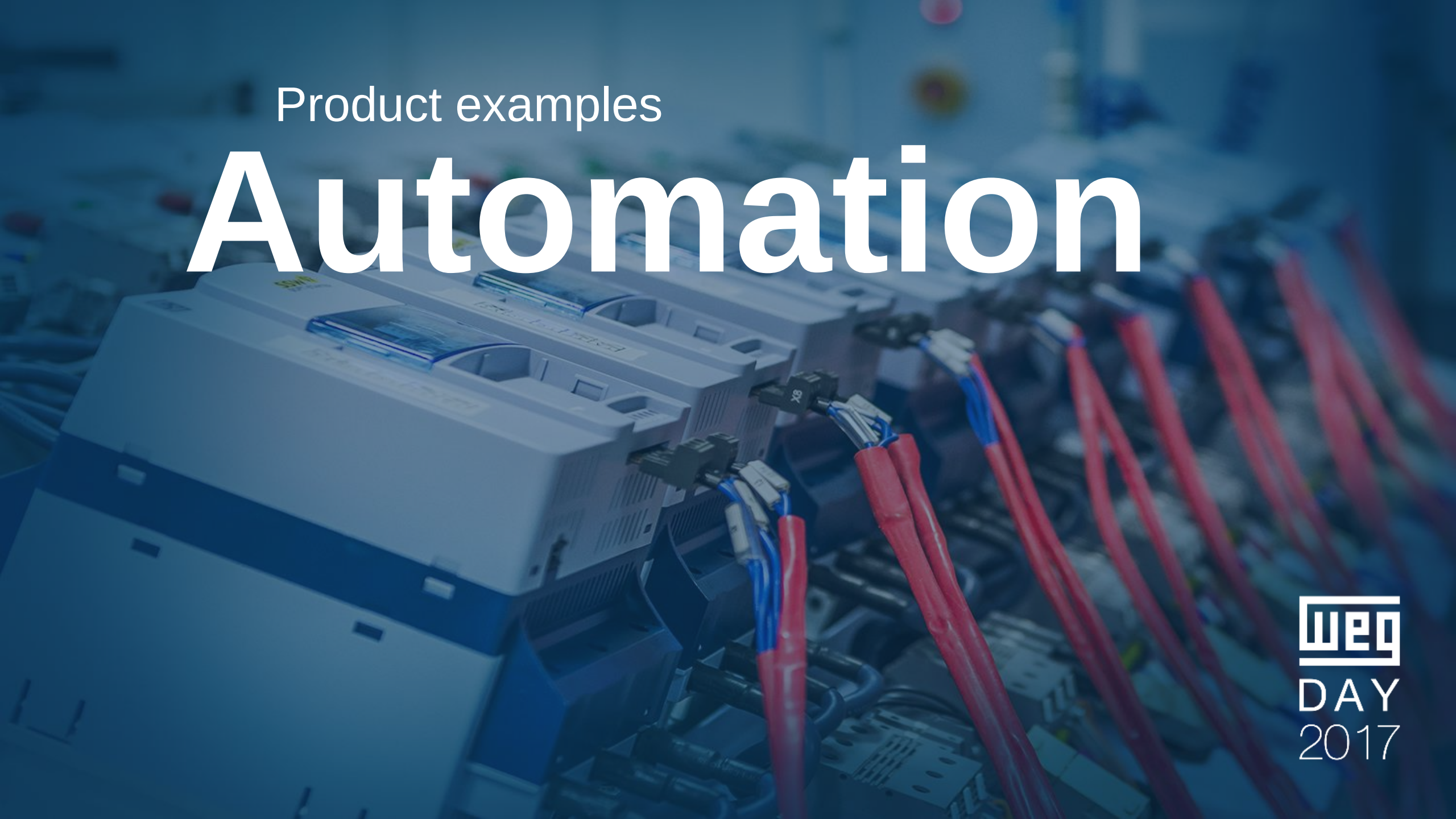

Product examples

Automation

WEG DAY 2017

MVW01 WEG Medium Voltage Inverter

For control and speed variation of medium voltage electric machines.

- Higher levels of market efficiency
- High power density
- High reliability
- Synergy with the WEG product line
- Complete system for the customer

PATENTED

OPTIMIZED MODULATION (OPP)
PATENT GRANTED

WEG DAY 2017

Wind Inverter

Application in WEG 2.1 MW Wind Turbine
Patented FlexPhase topology
Modular Design
Able to voltage sag

PATENTED

9
PATENTS
GRANTED/
PENDING

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Solar Electric Center

3.4 MW Solar Electric center
Solution for Solar Photovoltaic Plants
DC / AC Conversion
Connection at 34.5 kV
Quick Commissioning

WEG DAY 2017

Solar String Inverter 20 kW

WEG Automation
R&D Center Freiburg

Fraunhofer ISE

Fraunhofer-Institut für Solare Energiesysteme ISE

Paper Presentation:
Improved AC-Current Control
Based on State Space Control
Applied to Solar String Inverters

PEDG 2017

FLORIANÓPOLIS, BRAZIL - APRIL 17-20, 2017

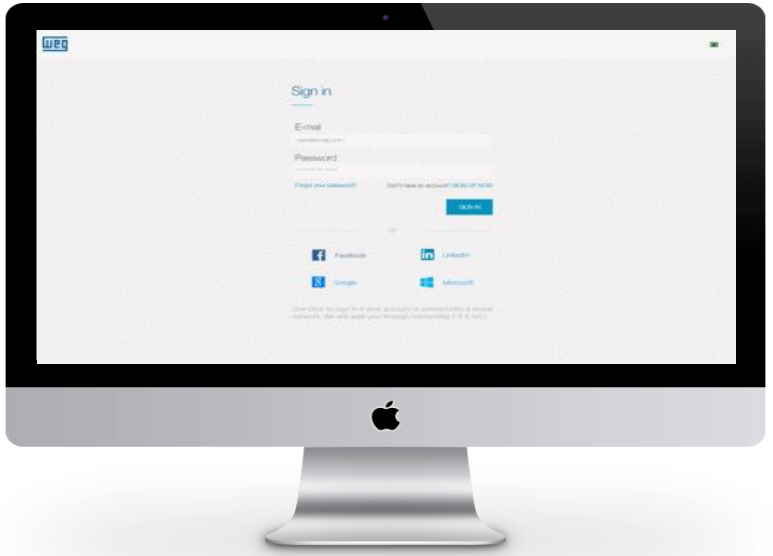
WEG IoT cloud

WEG DAY 2017

WMS - WEG Monitoring System

Solar String Inverter SIW600

WEG IoT cloud



IoT website

WEG DAY 2017

Contactor

Compact solution for starting motors

Auxiliary Contacts 1NA + 1NF Embedded

Mechanical interlocking "zero"

Surge Suppressor Blocks

Connection buses

Mirrored and mechanically connected

PATENTED

17
PATENTES
GRANTED /
PENDING

WEG DAY 2017

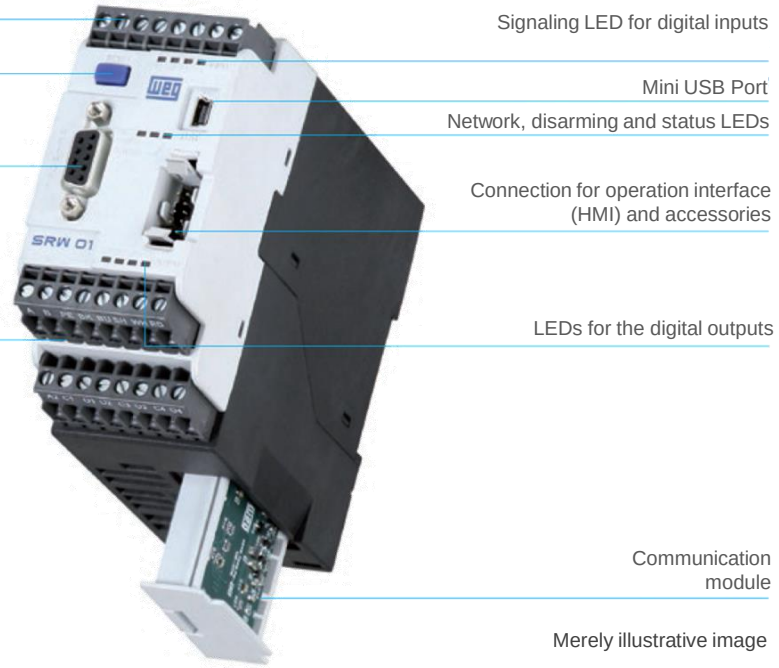
Intelligent Relay

PATENTED

Reduced size
Control unit: 4 inputs and 4 digital outputs (6 inputs and 4 digital outputs for Ethernet version)
Ease to change the communication module via an exclusive donation system
Programming via free WLP software or operating interface (HMI)

6
PATENTS
GRANTED/
PENDING

Application example



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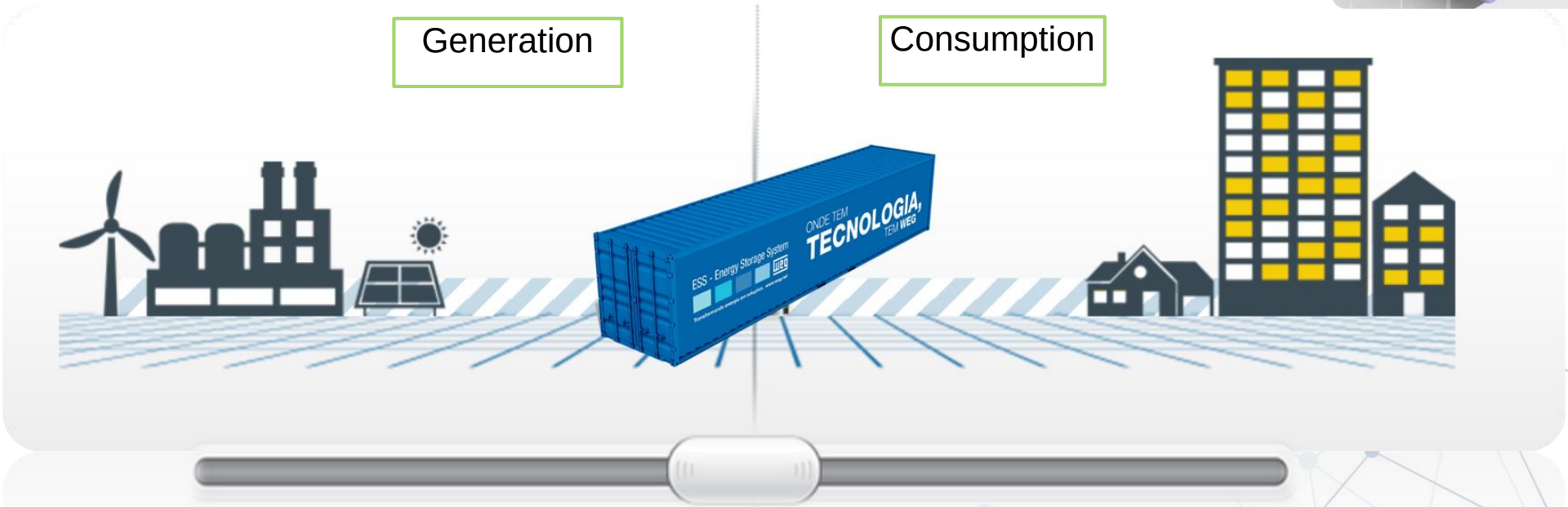
Energy Storage System

Power Storage System with Lithium Batteries

High efficiency (bidirectional conversion)
Silent and compact (multilevel technology)
System with stationary or mobile operation

Benefits:
Increasing the efficiency of solar and wind generation (intermittent renewable energies)
Reducing fuel consumption of generator sets
Stabilizing network frequency and voltage
Balancing generation and consumption
Reducing energy expenditure by storing energy in the low-cost hours to consume at the higher cost hours



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Product examples

Transmission & Distribution

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Wind Power Transformer

Transformer oil

Power: 2,310kVA
34.5CST/0.69 and 0.4kV

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Transformer with Vegetable Oil

- Biodegradable

- Safety fluid

- High viscosity

- Extended Life

WEG DAY 2017

Mobile Substations

Main benefits of mobile substations and transformers:

Mobility and flexibility in emergency
Reduction of interruptions in power supply
Reliability in the system
Facilitates preventive and corrective maintenance
Various transformation and switching ratios
Reduction of investments in backup equipment
Optimization of space and equipment weight
Temporary service to seasonal loads, new consumption and events

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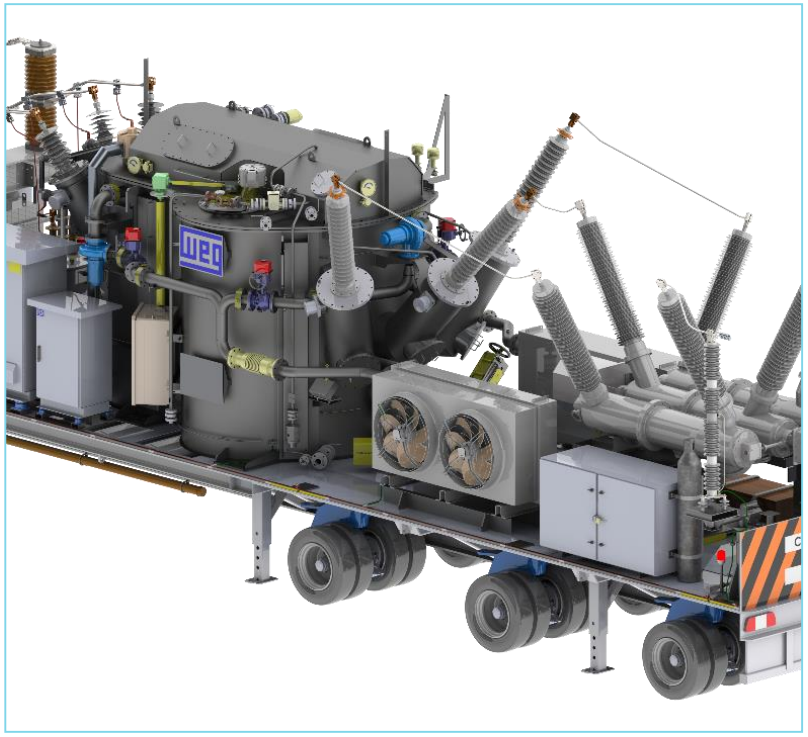
Compact Mobile Substation

- New constructive platform, more compact
- Better trafficability
- Fast and agile transportation set
- Optimized projects
- Compact and maneuverable equipment
- Maximization of the power-to-weight ratio carried
- Modular components



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Mobile Substation Divided into Modules

The division in modules facilitates the locomotion and installation in emergency situations.

Disconnect switch 550 kV

Disconnectors in 550 kV

Equipment designed to ensure the insulation of equipment, stretches of lines or substations with voltage levels of 550 kV. Innovative geometries applied to the product through numerical simulations and total certification based on the results of the dielectric tests carried out in the WEG high voltage laboratory.

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Product examples

Coatings

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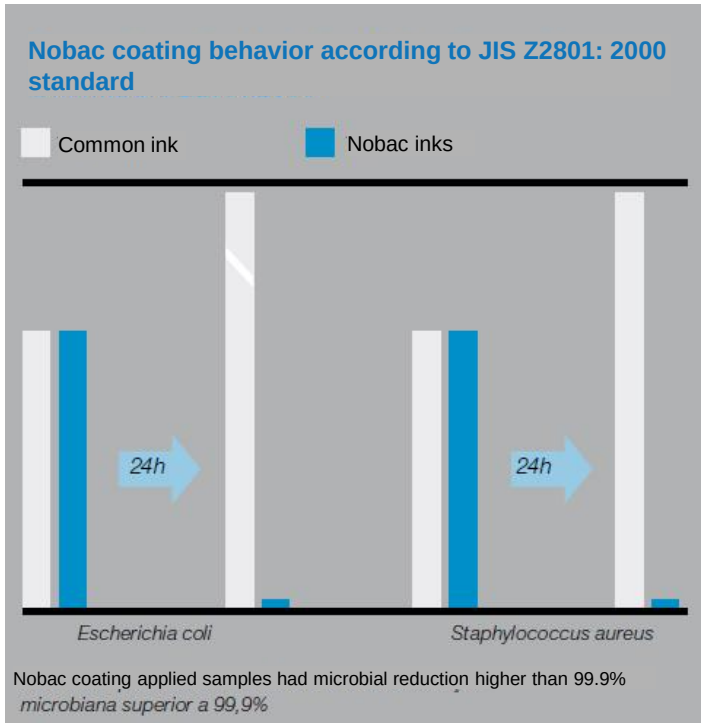
NOBAC
Antimicrobial paints

Paints that inhibit the proliferation of fungi and bacteria.



PATENTED

1
PATENT
GRANTED /
PENDING

WEG DAY 2017

Anti-fouling Paints

WEGMARINE Super 2400 *- For pleasure craft, it provides up to 24 months of protection and energy savings.*

WEG Oceano Super 240 *- Self-polishing coating with excellent performance. Suitable for fishing vessels.*

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Weathering Resistant Paints

WEGTHANE HIDRO HPA 501

High resistance to weathering (color and brightness).

High waterproofing power.

Ecologically correct

WEG DAY 2017

Anti flame coatings

Politherm Anti flame

In cases of fire, the hybrid powder coating, slows the spread of flames, allowing the protection of structures and people in route to escape.

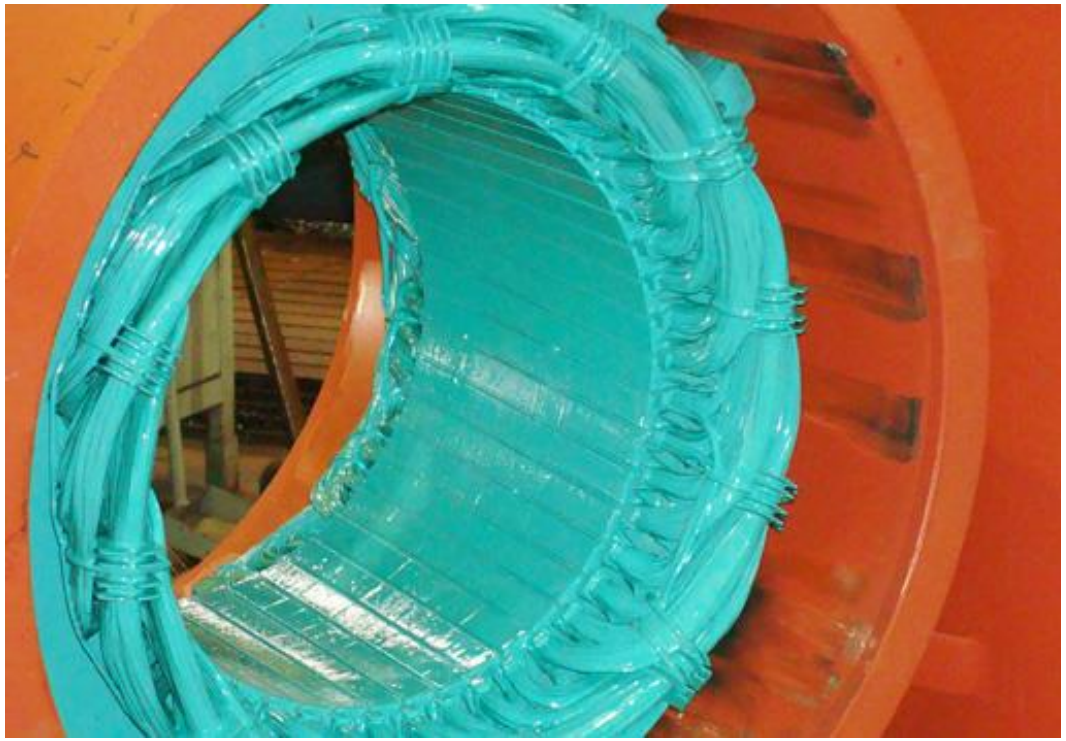
UNIQUE
AT
BRAZIL

WEG DAY 2017

Varnishes and Resins

Electro-insulators

- Wire enamel
- Polyester imide, polyamideimide and polyurethane
- High performance proven in application machines with high thermal class
- All wire gauges
- Various types of machines
- Impregnation Varnish
- Polyester and epoxy
- Excellent dielectric properties
- Flexibility
- Hardness
- Chemical resistance and adhesion
- Motors, transformers and generators of low and high voltage, all powers



WEG DAY 2017

WMS

WEG MANUFACTURING SYSTEM

DAY 2017

WMS - WEG Manufacturing System

Objectives

- ✓ Reduce the lead time
- ✓ Improve time to market
- ✓ Step up the company’s global management
- ✓ Increase the performance visibility of the units
- ✓ Improve the supply chain
- ✓ Exceed customers expectations

INCREASE COMPETITIVENESS

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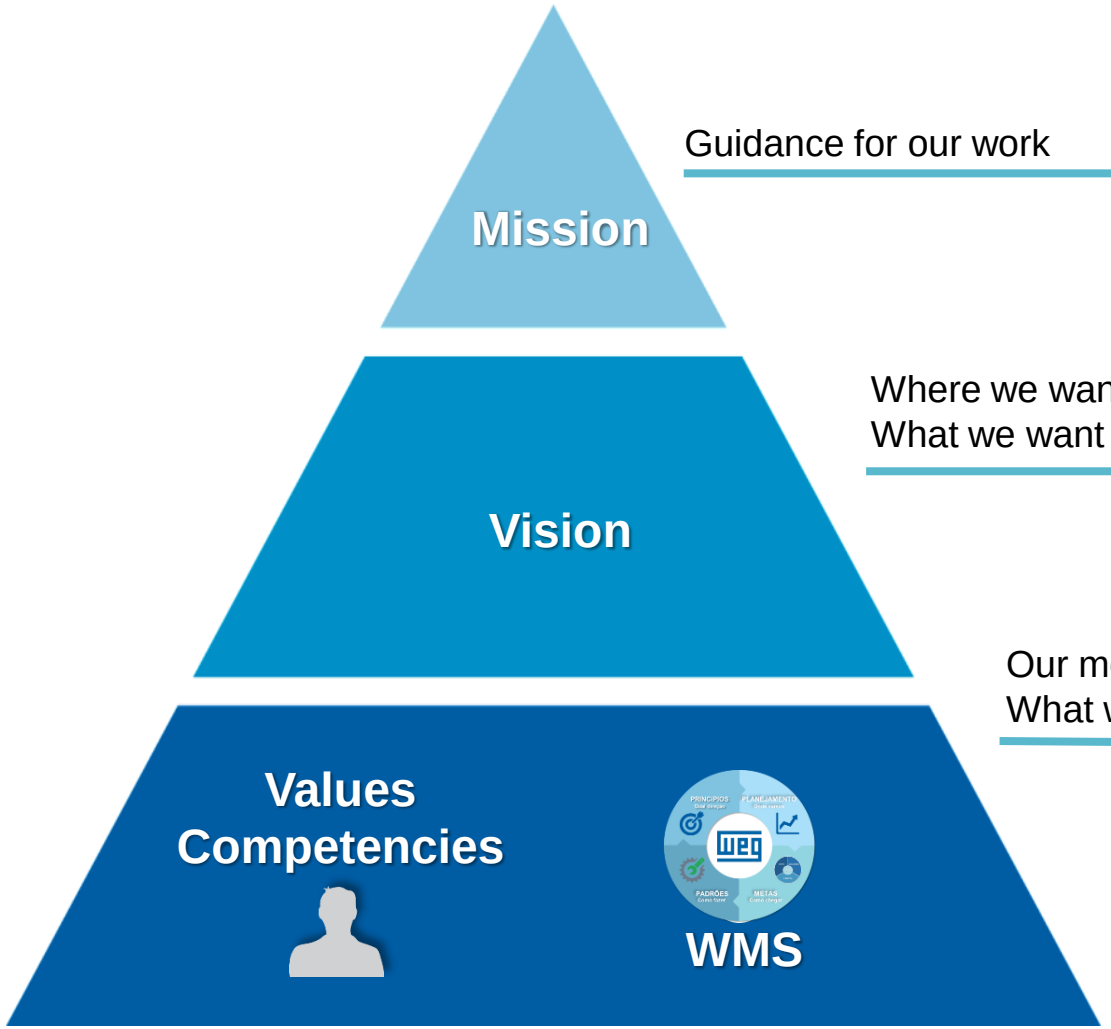
WMS - WEG Manufacturing System

Foundations



Guidance for our work

Where we want to go
What we want to be

Our motivation
What we continually exercise

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WMS - WEG Manufacturing System

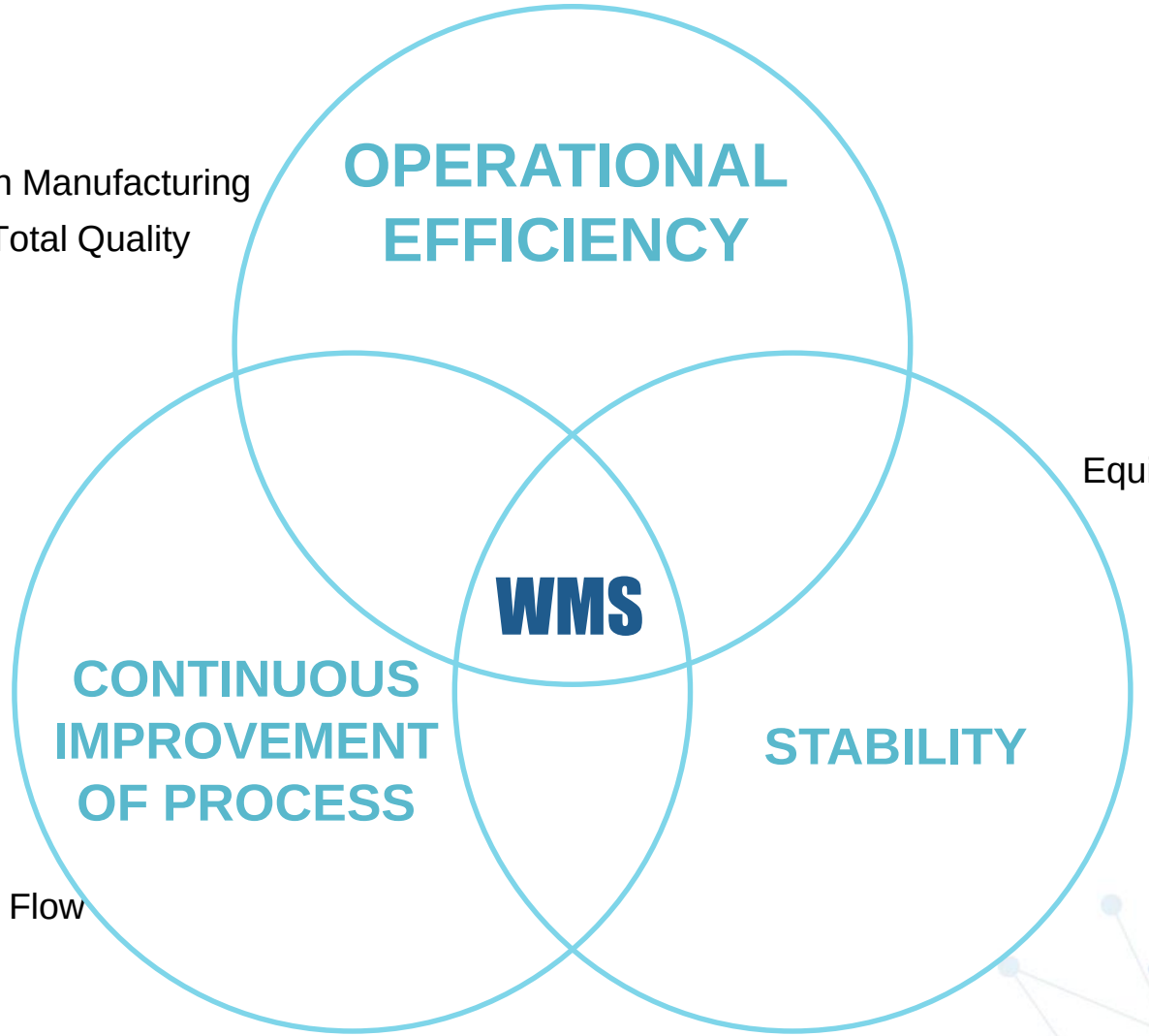
Guidelines

WEG DAY 2017

WMS - WEG Manufacturing System

Guidance

Lean Manufacturing
Total Quality



Availability of Equipment, Tools and Devices

Standardized Work
Continuous Flow

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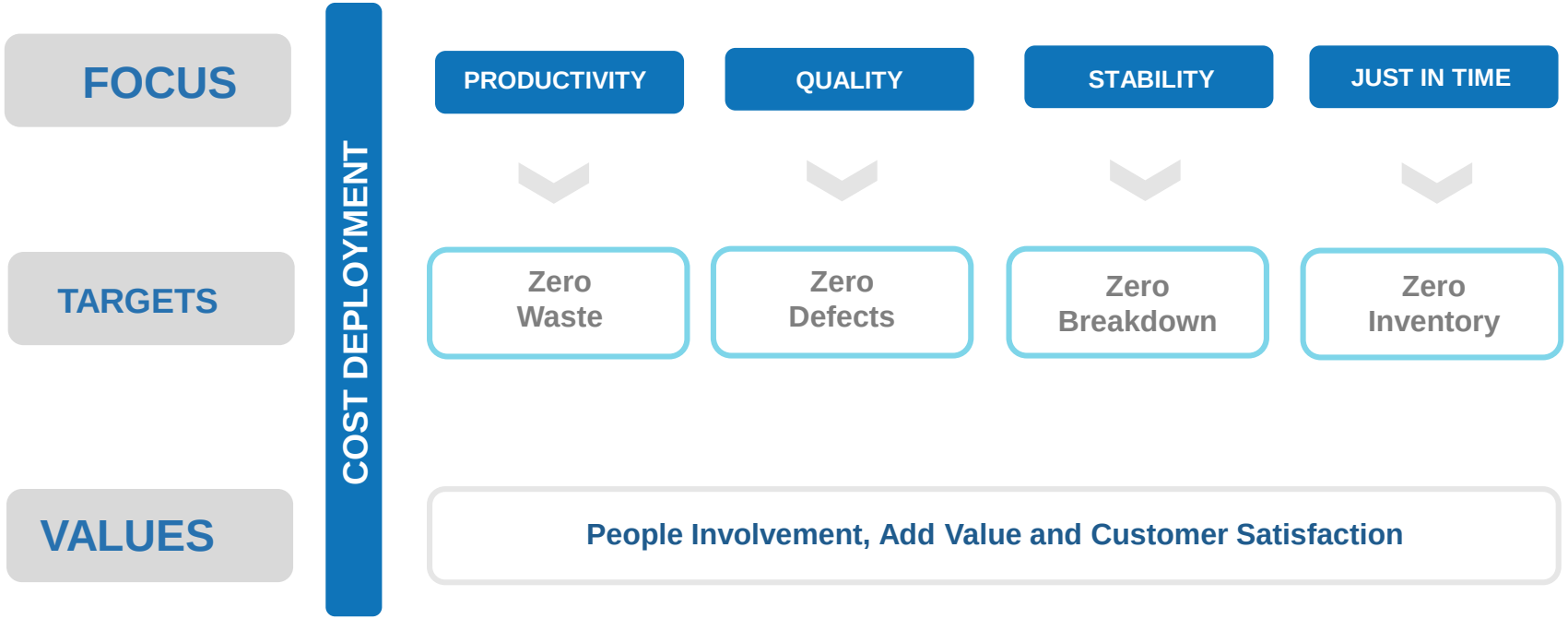
Drivers



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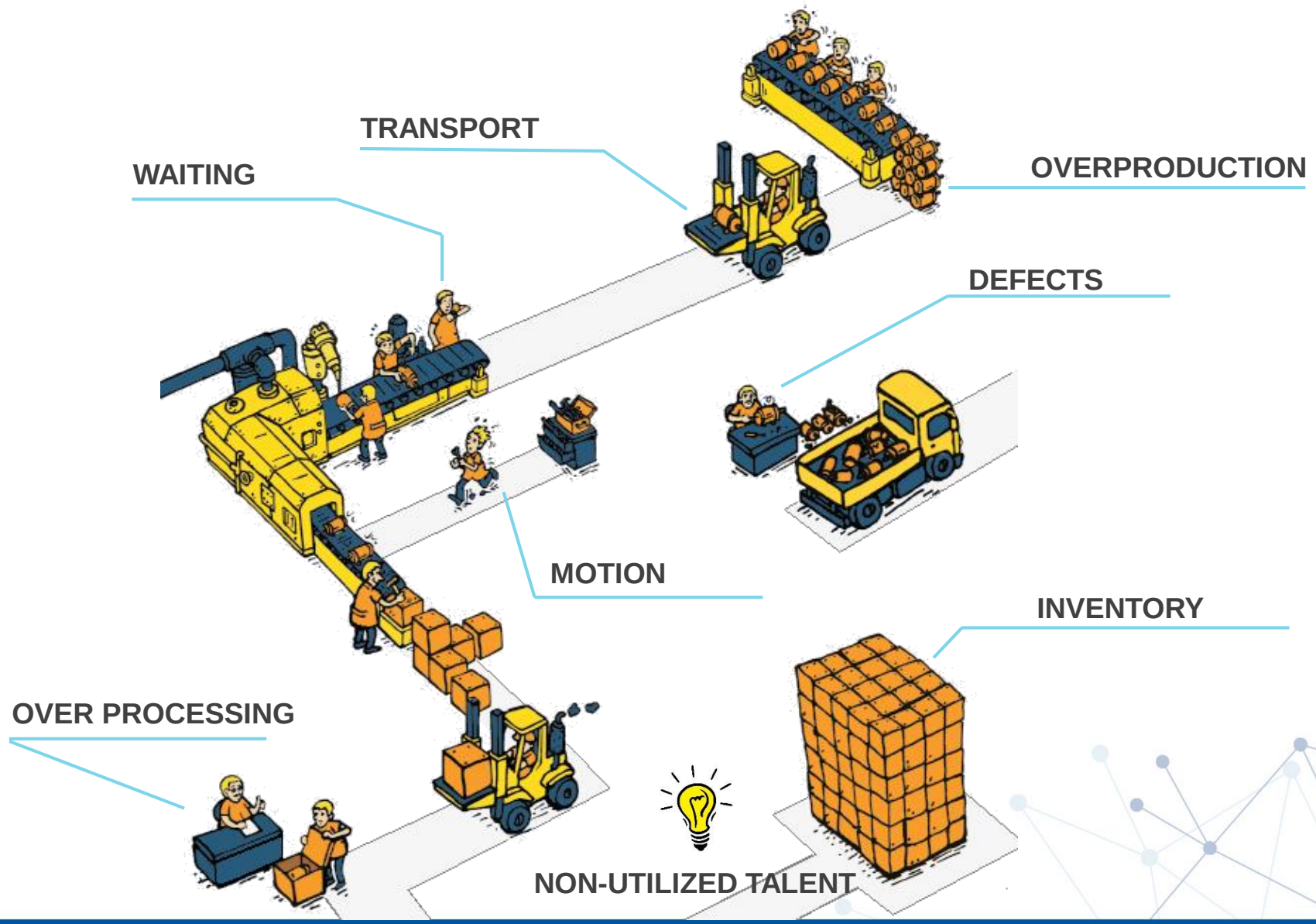
The EIGHT wastes



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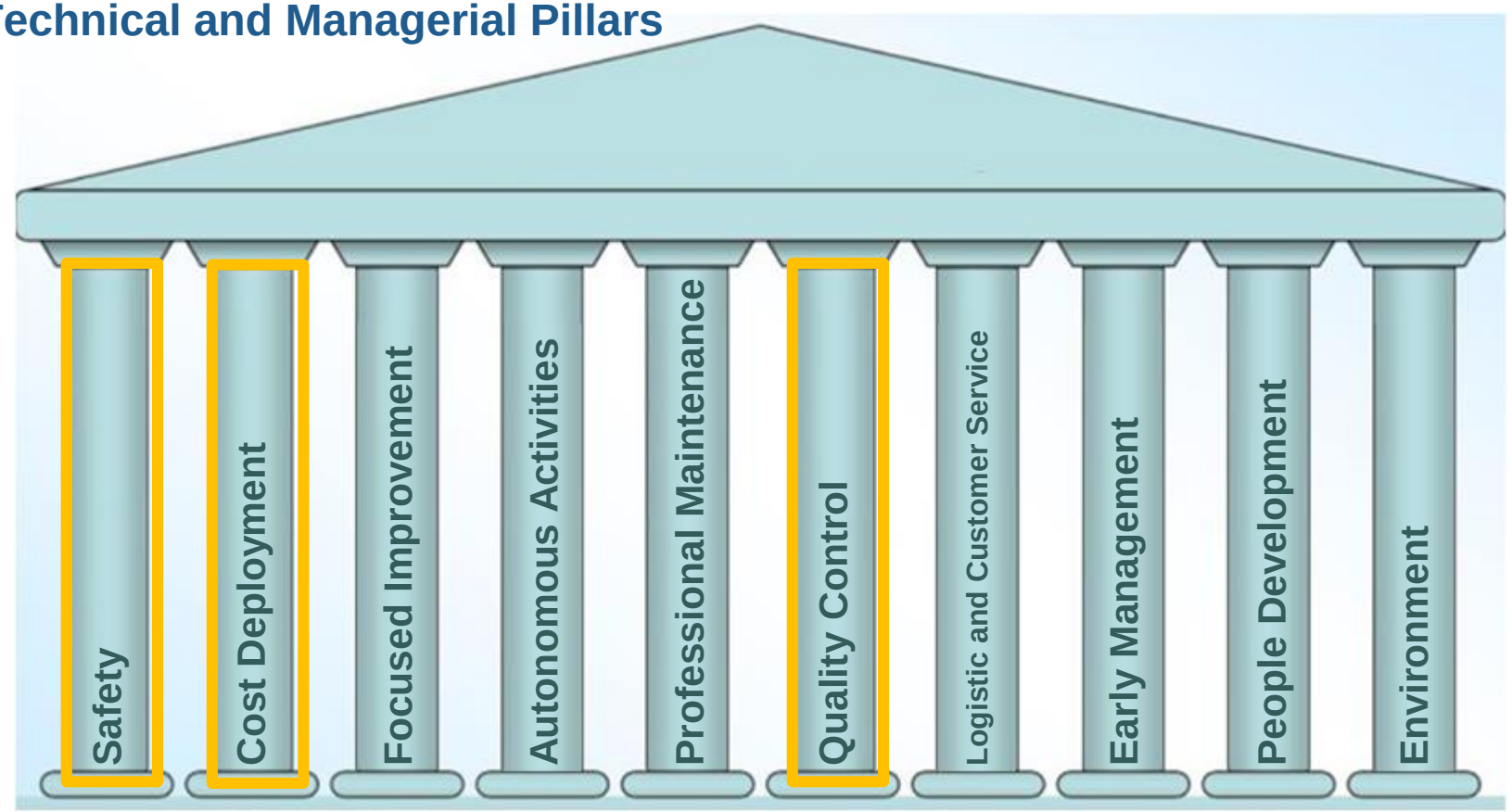
Technical and Managerial Pillars



Management Commitment	Road Map	Commitment of the Organization	Time and Budget	Level of Expansion
Clarity of Objectives	Allocation of Highly Qualified People to Model Areas	Competence of Organization towards Improvement	Level of Detail	Motivation of Operators

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Methodology

Cost Deployment

CONVERSION COSTS

WASTES AND LOSSES EVALUATION

OEE Losses
- Setup
- Breakdown (Maintenance)
- GCF Stoppage

Non-Quality Losses
- Scrap / Rework
- Scrap / Internal Customer Rew.
- Warranties (DM / EM)

Production Flow Losses
- Unbalanced line
- Uneven production planning
- Non-value added activities

Operational Losses
- Absenteeism
- Overtime
- Accidents

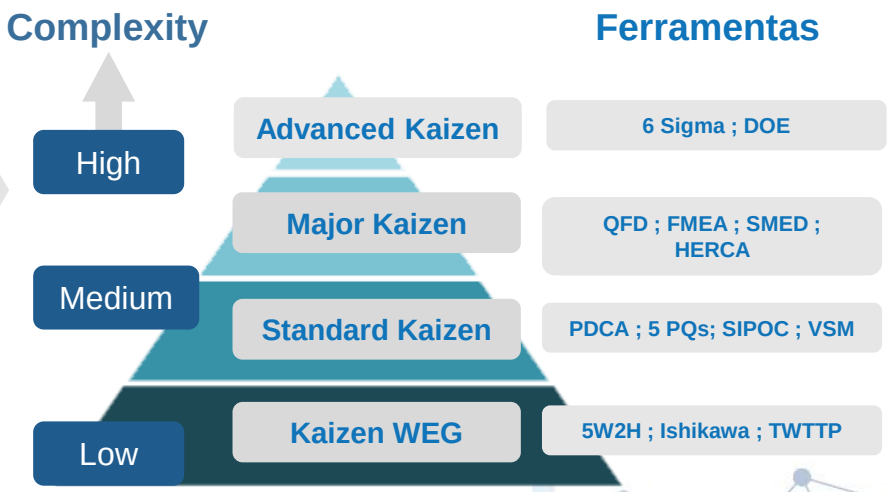
Material/Energy Losses
- Supply chain delays

DIRECTED BY PILLARS

- Safety
- Quality Control
- Logistics
- Professional Maintenance
- Environment
- People Development
- Autonomous Activities
- Early Management
- Focused Improvement

PRIORIZATION BY ICE (IMPACT / COST / EASYNESS)

IMPROVEMENT TEAMS



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Cost Deployment

Losses identified in the Cost Deployment of WMO (Million of R$) - 2016									
Department	Logistic	Quality	Maintenance	People Development	Focused Improvement	Early Management	Safety	Other Losses	TOTAL
Stamping	$$$$	$$$	$	$	$$$$$	$$	$	$	$$$$$
Shaft Machining	$$$$$	$	$$$	$	$$$$	$	$	$	$$$$$
Foundry IV	$	$$	$$$$$	$	$$$$	$	$	$	$$$$
Factory IV	$$$$	$$	$	$	$$$	$	$	-	$$$$
Factory III	$$$$	$$	$	$	$	$	$	-	$$$$
Factory VI	$$$$	$$	$$	$$	$$	-	$	-	$$$$
Casting Machining II	$$	$	$	$	$$$$	-	$	$	$$$$
Foundry II	$$	$$$$	$$	$	$$	-	$	-	$$$$
Factory I	$$$$	$	$	$	$	-	$	-	$$$$
Casting Machining I	$	$$	$	$	$$$	-	-	$	$$$$
Aluminum Injection	$$$	$	$	$	$$$	-	$	-	$$$
Foundry III	$	$$	$$$	$	$$	-	-	$	$$$
Factory VII	$$$	$	$	$	$	-	$	-	$$$
Foundry I	$	$	$	$	$	-	$	-	$$
Wires Factory	$	$	$	$	$	-	$	$	$$
Other	-	-	-	-	-	-	$	-	$
Total	$$$$$	$$$$	$$$$	$$	$$$$$	$$	$$	$$	$$$$$

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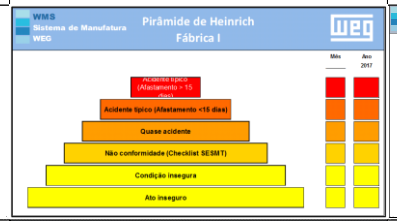
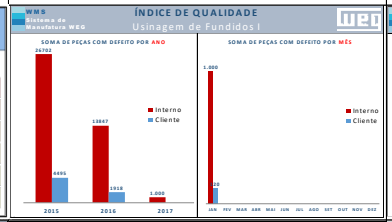
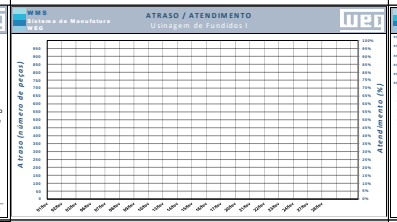
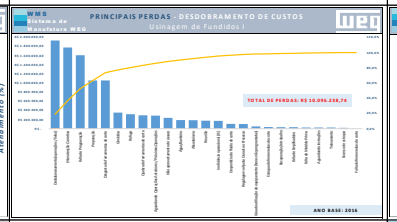
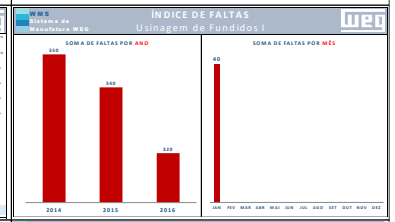
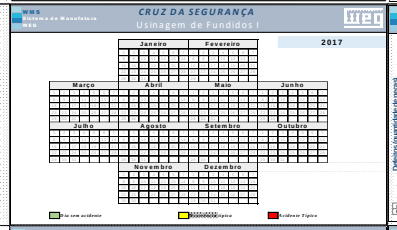
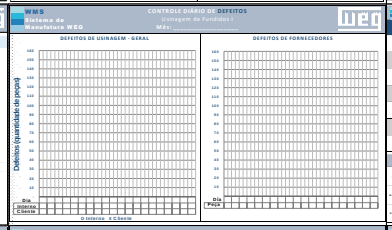
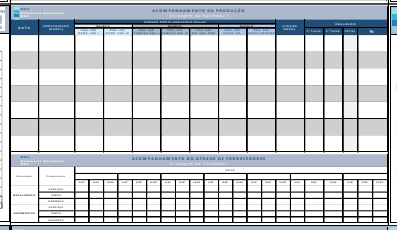
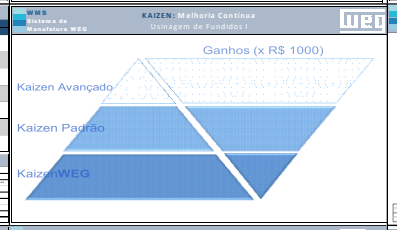
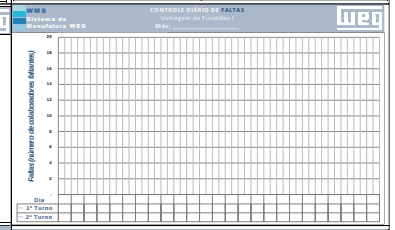
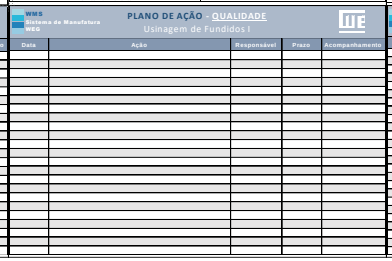
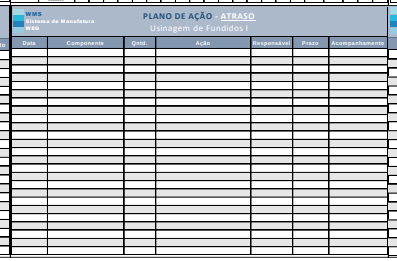
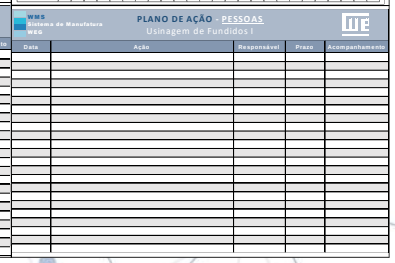
Routine Management

ROUTINE MANAGEMENT

	SAFETY	QUALITY	PRODUCTIVITY	COSTS	PEOPLE
OUR OBJECTIVES					
OUR TARGET	ZERO ACCIDENT	ZERO DEFECT	ZERO DELAYS	ZERO WASTES	ZERO ABSENTEISM
WHERE WE ARE?	_____ accidents _____ days without accidents	_____ parts	_____ delayed parts _____ delayed orders	_____ Kaizens Performed	_____ absenteism
INDEX					
DATA					
ACTIONS					

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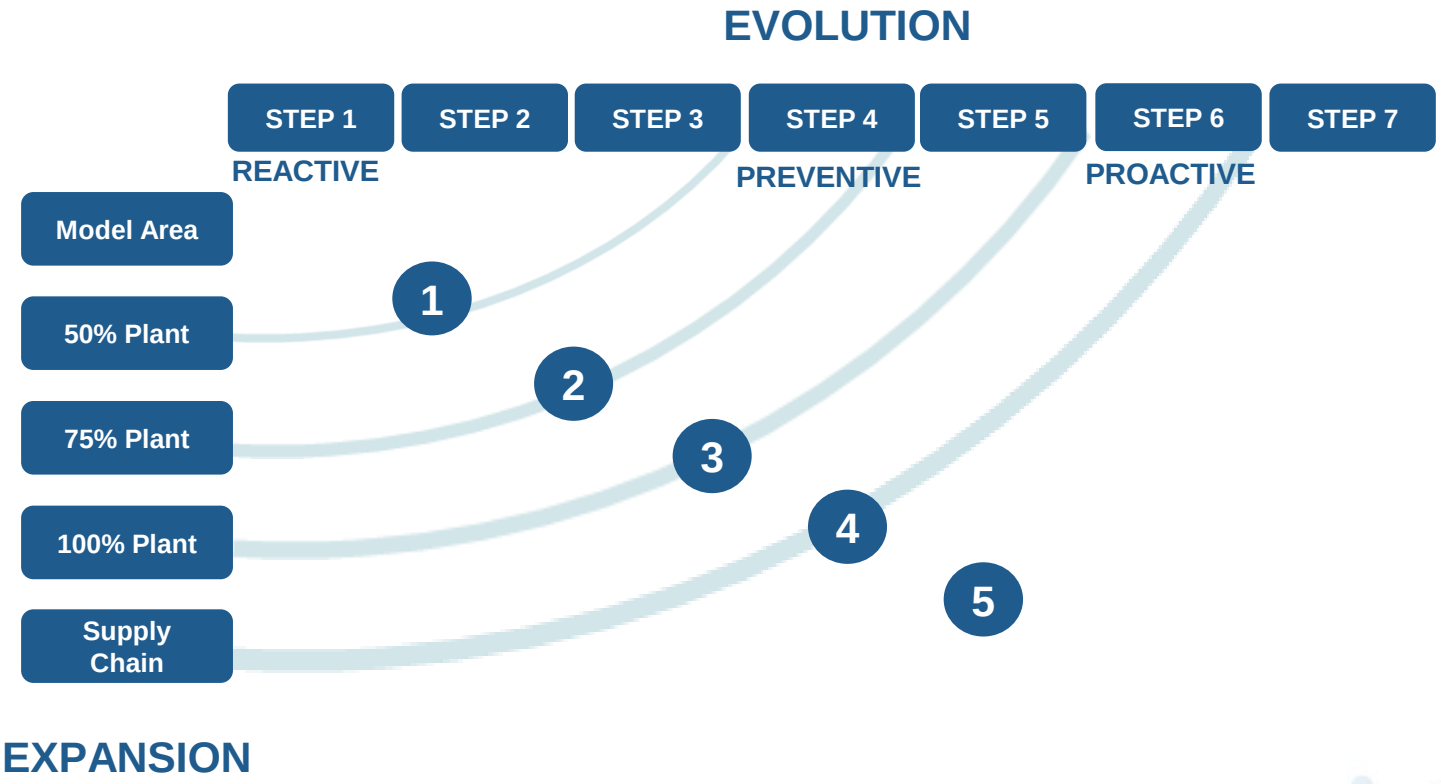
Evaluation Systematics / Audits

7 STEPS OF EVOLUTION



Each one of the 20 pillars is classified in 5 levels
The global evaluation of the Plant is summarized in one index

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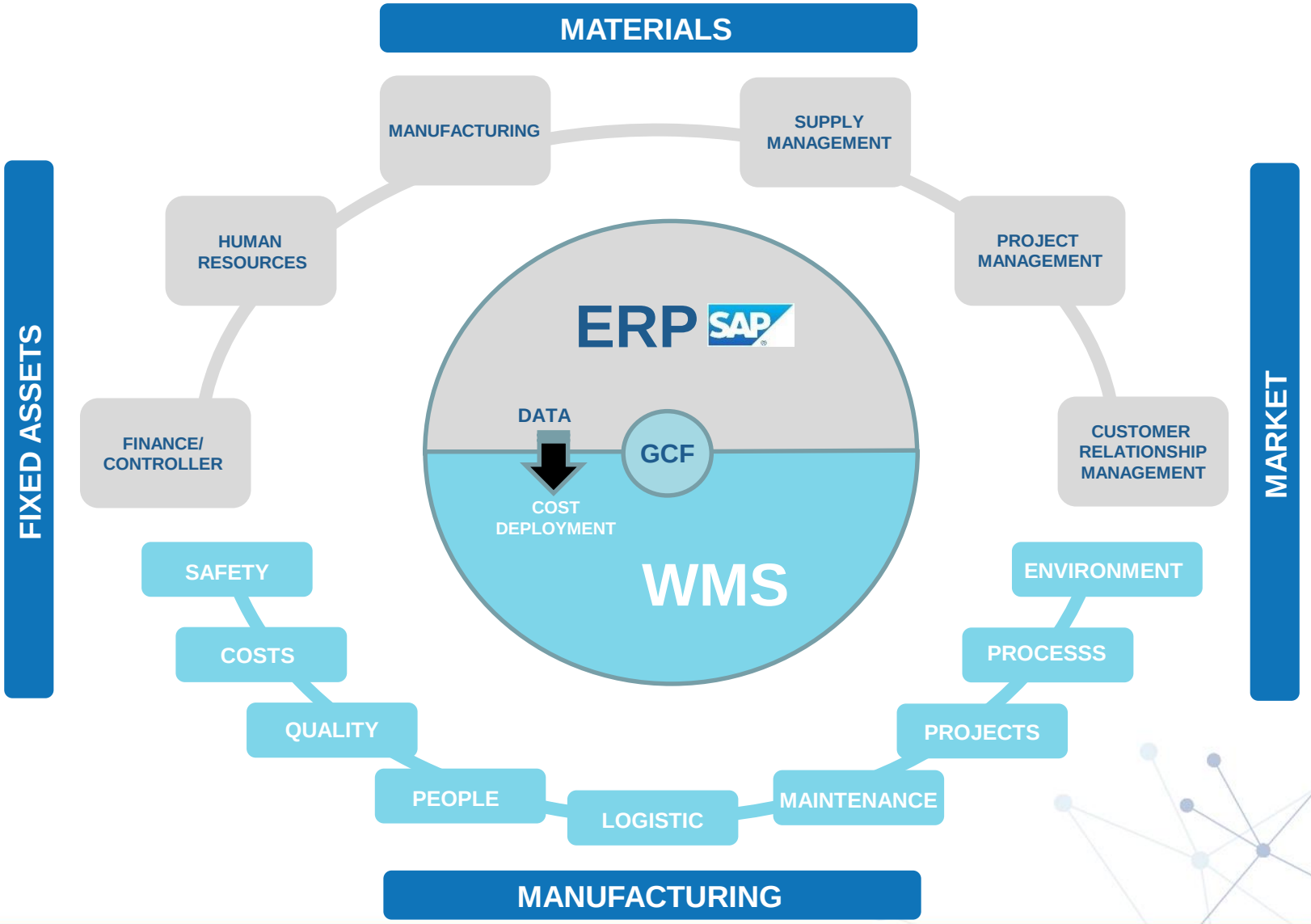
Management Innovation



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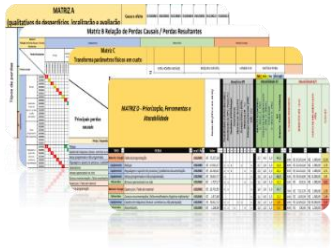
The WEG Manufacturing System path

LOGIC

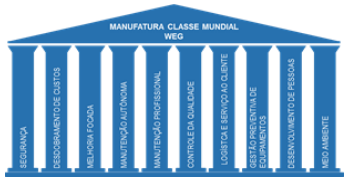
Cost Deployment

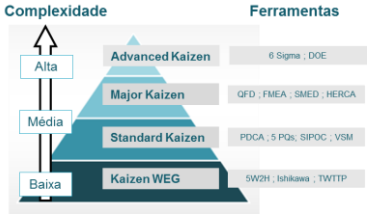


8 DESPERDÍCIOS

METHODS AND TOOLS

10 Pillars

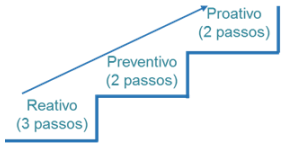




RIGOR

Model Area

7 PASSOS



RHYTHM

Routine Management

RESULTS

STANDARDIZATION

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